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CONTENTS

PAGE

GOLDING, F. D., M.A., F.R.E.S. The ACRIDIDAE (Orthoptera) of Nigeria . . . . . 517–587 18 maps.

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THE ACRIDIDAE (ORTHOPTERA) OF NIGERIA.

By F. D. Golding, M.A., F.R.E.S.

Manuscript received 29th September, 1947.

(Read 2nd June, 1948.)

With 18 Maps.

Contents.

		PAGE
I.	Introduction	517
II.	Range	518
III.	Local Distribution	518
IV.	Seasonal Incidence of Adults	521
V.	Bionomics	521
VI.	Notes on the Localities in which collections were made	521
VII.	The Specific Identity of Chad Acrididae	526
VIII.	Notes on the Acrididae of Nigeria—	
	Acridinae	526
	Oedipodinae	539
	Pyrgomorphinae	547
	Catantopinae	554
IX.	Analysis of Section VIII—	
	(*a*) Local Distribution	578
	(*b*) Life Histories	579
	(*c*) Phototaxis and migration	580
	(*d*) Gregarious tendencies	581
	(*e*) Relative sizes of the sexes	581
	(*f*) Colour forms	582
	(*g*) Notes on the Acrididae of Ibadan	582
	(*h*) Notes on the Acrididae of Kalkala	583
X.	Summary	585
XI.	Acknowledgments	585
XII.	References	586

I. Introduction.

A study of the Acrididae of Nigeria was made between 1931 and 1947. Collections and observations were made in every part of the country visited, and the number of species represented in the reference collection at Moor Plantation, the headquarters of the Agricultural Department, is now 164 as compared with 6 in 1930.

As the writer and his African assistants did not have occasion to visit all parts of Nigeria in the course of their official duties, the help of other members of the Agricultural Department and of several of the writer's friends was enlisted and, finally, collections of Acrididae from the Colony and each of the 23 Provinces of Nigeria were obtained.

As some species are present for only two or three months in the year, it is necessary to make observations throughout the year in any locality in

order to acquire an adequate knowledge of its Acridid fauna. Studies throughout the year have been made in only two localities, at Ibadan between the years 1931 and 1947, and at Kalkala, a village at the south-western corner of Lake Chad, by the writer and his former colleague, Dr. A. M. Gwynn, M.C., between 1932 and 1934. The total number of species encountered was 94 at Kalkala and 63 at Ibadan; of these only 15 were common to the two localities. The vast majority of the bionomical data were obtained in these two localities, whilst the collections made in or received from the remaining parts of the country were mainly of use in determining the local distribution of the various species.

With the exception of Uvarov's paper (13) on an extensive collection of grasshoppers made by Dr. Ll. Lloyd at Sherifuri in about 1924, and a previous paper of the writer's (5), very little information has been published about the Acrididae of the country. All the available data have been incorporated in the present paper. Lloyd obtained 58 species at Sherifuri, a village " on the great plain which extends without interruption to Lake Chad some 200 miles to the north-east "; it is remarkable that as many as eleven of the species collected by Lloyd have not been encountered by the writer.

This paper deals with some 200 species of Acrididae belonging to 109 genera. These are divided amongst the four subfamilies found in Nigeria as follows:—Acridinae 66 and 34; Oedipodinae 25 and 16; Pyrgomorphinae 21 and 11; Catantopinae 88 species and 48 genera.

Many species are extremely rare and there is little known about them, but for the commoner grasshoppers data are given under the following four headings:—(*a*) Range, (*b*) Local distribution, (*c*) Seasonal incidence of adults, and (*d*) Bionomics.

II. Range.

Particular attention was paid to the Ethiopian Region, and most of the entomologists in that zoogeographical area have kindly supplied the writer with lists showing which Nigerian grasshoppers also occur in their territories. In addition, Mr. K. M. Guichard kindly collected 245 specimens in the Middle Niger region of French Sudan and 76 near Lac Fittri in French Tchad, and Mr. D. J. Billes made a valuable collection at Tafo in the Gold Coast.

The sparse data for the other zoogeographical regions were abstracted from the available literature, which was not very extensive.

To save trouble, lists of the known Nigerian Acrididae were sent to the various entomologists in the Ethiopian Region with a request that they should mark those species occurring in their territory. The words " data incomplete " signify that the species was identified after the lists had been circulated.

The abbreviations used to denote the various territories are shown in Table I.

III. Local Distribution.

Local distribution is shown either by maps, on which are presented the positions of 34 main collecting localities, or by giving a list of all the stations in which the particular species has been recorded. Many of the listed localities do not appear on the map, and a guide to their approximate position is given in Table II.

Table I.

Abyss. .	Abyssinia.	Ken. .	Kenya.
A.E. Sud.	Anglo-Egyptian Sudan.	N. Rhod.	Northern Rhodesia.
B.C. .	Belgian Congo.	Nyasa.	Nyasaland.
E. Afr.	East Africa (general).	P.E. Afr.	Portuguese East Africa.
Fr. Cam.	French Cameroun.	P. Guin.	„ Guinea.
Fr. Guin.	„ Guinea.	P.W. Afr.	Angola.
Fr. Nig.	Colonie du Niger.	S.L. .	Sierra Leone.
Fr. Sen.	French Senegal.	Som. .	Somaliland.
Fr. Sud.	„ Soudan.	S. Afr.	Union of South Africa.
Fr. Tch.	„ Tchad.	S.W. Afr.	South-west Africa.
Gab. .	Gaboon.	S. Rhod.	Southern Rhodesia.
Gamb.	The Gambia.	T.T. .	Tanganyika Territory.
G.C. .	The Gold Coast.	Togo. .	Togoland (general).
I.C. .	The Ivory Coast.	Ug. .	Uganda.

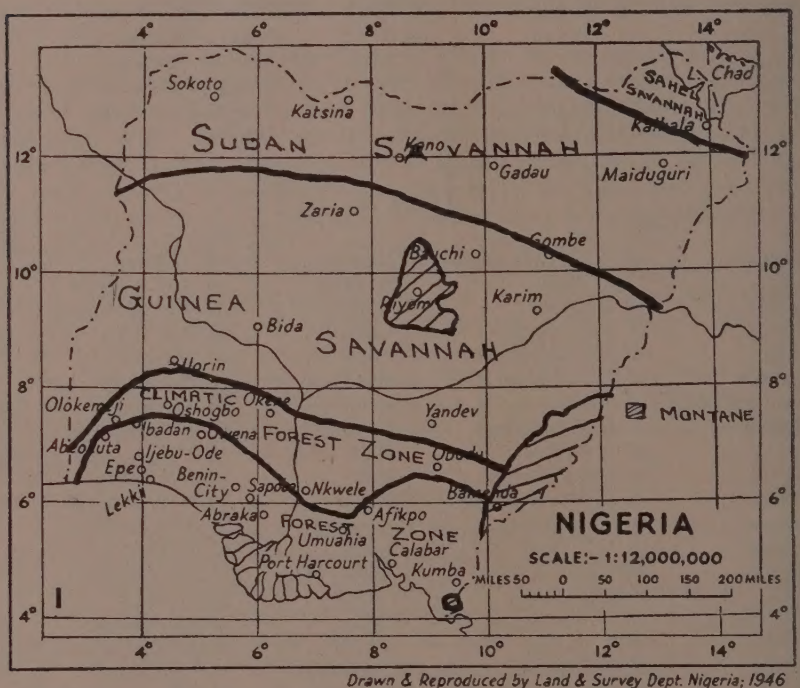
Table II.

	Miles.		*Miles.*
Abeli Ash.	18 W.N.W. B. Seyoram.	Kazaure .	44 N. Kano.
Afon .	12 S. Ilorin.	Kukawa .	40 N.W. Kalkala.
Akure .	16 E. Owena.	Kingowa .	20 W. B. Seyoram.
Bakura .	50 S.E. Sokoto.	Lafiagi .	63 N.E. Ilorin.
Balah .	10 S.W. Ilorin.	Lagos .	50 W. Lekki.
Bambur .	14 N.W. Karim.	Mafindere	9 E. Kalkala.
Barakin Ladi	11 S.E. Riyom.	Mamu .	20 S. Ibadan.
Bode Sadu	36 N.N.E. Ilorin.	Marariya	30 S.W. Kalkala.
Daura .	50 E. Katsina	Marte .	14 S.W. „
Demsa .	70 E.N.E. Karim.	Meko .	72 W. Ibadan.
Dikwa .	50 E.N.E. Maiduguri.	Metele .	28 N.W. B. Seyoram.
Dongo .	50 S.W. Kalkala.	Mongonu	28 N.W. Kalkala.
Dumagi .	50 N.E. Ilorin	Mufio .	40 W.S.W. „
Enugu .	46 E.N.E. Nkwele.	Mutum Daya	12 N.W. Karim.
Fika .	80 S.E. Gadau.	Nahuce .	60 E. Kano.
G. Usumanu	8 W. Karim.	Ngala .	20 S.E. Kalkala.
Gambari .	12 S. Ibadan.	N'guru .	75 N.N.E. Gadau.
Gajibo .	28 S. Kalkala.	Oke Onigbin	36 S.E. Ilorin.
Gimeri .	12 N.W. „	Omu Aran	46 S.E. „
Gindi Akwati	13 S.S.E. Riyom.	Oro .	30 S.E. „
Gombe .	83 E. Bauchi.	Oyo .	31 N. Ibadan.
Gumnari .	15 N.W. Kalkala.	Ringim .	44 E. Kano.
Gusau .	86 S.W. Katsina.	Sapele .	30 S. Benin.
Gusko .	35 N.N.W. Kalkala.	Sapoba .	23 S.E. „
Igbogun .	10 E. Lekki.	Share .	35 N.E. Ilorin.
Ingawa .	37 S.E. Katsina.	Sherifuri .	11 N. Gadau.
Isoba .	10 N.W. Pt. Harcourt.	Wulgo .	15 E. Kalkala.
Jos .	21 N.N.E. Riyom.	Wurge .	10 S.W. „
Kasa .	37 S.E. Kalkala.	Yola .	90 E. Karim.
Kauwa .	38 N.N.W. „	Zurmi .	57 W.S.W. Katsina.

Note.—The following abbreviations are used in Table II: Abeli Ash. for Abeli Ashettammari, G. Usumanu for Gidan Usumanu and B. Seyoram for Baga Seyoram; this last village is the port of the Nigerian shore of Lake Chad, and is situated at the extremity of the peninsula shown on map No. I.

The term " Coastal Belt " is used below for a narrow strip of coastline, about 60 miles long, stretching from Lagos through Lekki to Igbogun.

In describing the local distribution of many species use is made of terms relating to the vegetation zones of Nigeria. Map No. 1 is based on data kindly given to the writer by Mr. R. W. J. Keay and the late Mr. A. P. D. Jones of the Forests Department. The Forest Zone contains many areas where the activities of the people have resulted in the disappearance of the forest, but vegetation typical of that zone remains in areas[1] undisturbed by



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Map No. 1.—Vegetation Zones (after Keay and Jones). *N.B.*—The Climatic Forest Zone is part of the Guinea Savannah or " orchard bush."

man. The term " true forest zone " is used to denote collecting localities such as Gambari, Mamu, Owena, Benin and Sapoba, where grasshoppers were taken in small clearings in undisturbed forest. The Climatic Forest Zone is a belt climatically suited to forest trees, but the annual fires in the tall grassland make their survival impossible, except in very localized areas near rivers and streams, thus resulting in vegetation of the " orchard bush " type. The Coastal Belt lies between the Lekki Lagoon and the Bight of Benin and has a sandy soil; the Coconut Palm is the only common tree. A strip of

[1] The writer has been informed by Mr. A. C. Trueblood that whilst this " high forest " if at present undisturbed by man, in most cases it actually consists of very old secondary sorest, having been disturbed by agricultural activities at some period in the past.

Guinea Savannah (" orchard bush ") extends southwards to the coast to the west of Abeokuta, and it is shown below that three species of ACRIDIDAE, typical of the Savannahs, are found in both this strip and the Coastal Belt, although they are absent from the Forest Zone.

Patches of forest at Oro, Oke Onighin and Omu Aran, villages lying between 30 and 46 miles to the south-east of Ilorin, were found to contain several species of grasshoppers which are typical of the Forest Zone; these species were absent from all the other localities in the Ilorin Province to the north and north-west.

IV. SEASONAL INCIDENCE OF ADULTS.

The time of occurrence of the adults provides a valuable clue to the life cycle. For the rarer species the actual dates on which adults were collected are given; for the common species the months in which they were found (usually at either Kalkala or Ibadan) are recorded. Throughout the paper when more than one individual was seen on a certain date the number is shown in brackets, e.g. if two adults were found on 2nd April, the data would be recorded as " 2(2) Apr.," and if two were taken in the month of April as " Apr. (2)."

V. BIONOMICS.

The life-history of *Zonocerus variegatus* L. was studied between 1932 and 1936 (6); time was not available for similar work on the remaining species and, apart from the breeding of hoppers for identification purposes, no cage experiments were undertaken. Observations were made in the field on the occurrence of adults and hoppers and of copulation and teneral adults; in addition, females were dissected to determine the state of ovarian development at different times of the year. Many data were obtained for the commoner species, and it was usually possible to deduce the number of generations a year with some confidence and to detect the existence of an embryonic diapause when present.

Field observations were made on the food-plants of the different species of ACRIDIDAE; these were not very numerous, as it is seldom that a grasshopper (except the lethargic species) is seen actually feeding. Many of the habitats at Kalkala (5) consisted largely of one species of grass and, no doubt, the grasshoppers characteristic of a habitat of this type feed on the dominant grass. A list of food-plants and of the dominant species of habitats is given in Table III below; in most cases the generic name is used in the text.

VI. NOTES ON THE LOCALITIES IN WHICH COLLECTIONS WERE MADE.

(a) *General.*

As stated above, the only localities in which collections were made in every month of the year were Kalkala and Ibadan; many thousands of ACRIDIDAE were caught in each area, and it is certain that nearly all the local species were encountered. It will be remembered that the number of species taken at Kalkala was 94 and at Ibadan 63. The writer was stationed at Kalkala from 21 Dec., 1932, to 30 June, 1933, whilst Gwynn was there from 5 Sept., 1933, to 30 Jan., 1934, and from 23 May to 20 Oct., 1934. Gwynn left the

Table III.

Family.	*Name of Plant.*	*Name used in text.*
Menispermaceae	*Cissampelos ovariensis* P. Beauv.	..
Crassulaceae	*Bryophyllum pinnatum* S. Kurz	..
Amaranthaceae	*Amaranthus caudatus* Linn.	..
Onagraceae	*Jussieua linifolia* Vahl.	..
Myrtaceae	*Psidium guajava* Linn.	Guava.
Combretaceae	*Guiera senegalensis* Lam.	..
Tiliaceae	*Triumfetta cordifolia* G. & P., var. *Hollandii* Sprague	..
Malvaceae	*Hibiscus esculentus* Linn.	Okra.
Euphorbiaceae	*Ricinus communis* Linn.	Castor.
Moraceae	*Ficus capensis* Thunb.	..
Anacardiaceae	*Mangifera indica* Linn.	Mango.
Loganiaceae	*Anthocleista nobilis* G. Don.	..
Apocynaceae	*Rauwolfia vomitaria* Afz.	..
,,	*Thevetia neriifolia* Juss.	..
Asclepiadaceae	*Calotropis procera* Ait.	..
Compositae	*Aspilia latifolia* Oliv. & Hiern.	..
,,	*Pulicaria undulata* DC.	..
,,	*Helianthus annuus* Linn.	Sunflower.
,,	*Zinnia* sp. (garden plant)	Zinnia.
Solanaceae	*Solanum verbascifolium* Linn.	..
Scrophulariaceae	*Torenia* sp. (garden plant)	Torenia.
Acanthaceae	*Peristrophe bicalyculata* Nees	..
Verbenaceae	*Verbena* sp. (garden plant)	Verbena.
Labiatae	*Salvia* sp. (garden plant)	Salvia.
,,	*Leucas martinicensis* R. Br.	..
Musaceae	*Musa sapientum* Linn.	Banana.
Zingiberaceae	*Costus afer* Ker.	..
Cannaceae	*Canna* sp. (garden plant)	Canna.
Gramineae	*Eleusine indica* Gaertn.	..
,,	*Chloris Gayana* Kunth.	..
,,	*Cynodon Dactylon* Pers.	..
,,	*Sporobolus pyramidalis* P. Beauv.	..
,,	*Panicum maximum* Jacq.	..
,,	*Echinochloa pyramidalis* H. & C.	..
,,	*Urochloa lata* Hubbard	..
,,	*Paspalum conjugatum* Berg.	..
,,	*P. scrobiculatum* Linn., var. *polystachyum* Stapf.	..
,,	*Brachiaria ramosa* Stapf.	..
,,	*Pennisetum mollissimum* Hochst.	..
,,	*P. purpureum* Schum.	..
,,	*P. polystachon* Schult.	..
,,	*P. typhoides* Stapf & Hubbard	Bulrush Millet.
,,	*Imperata cylindrica* Beauv., var. *Thunbergii* Dur. & Schinz.	..
,,	*Sorghum* spp. (cultivated)	Guinea Corn.
,,	*Sorghum aethiopicum* Rupr.	Sorghum.
,,	*Cymbopogon giganteus* Chiov.	..
,,	*Hyparrhenia dissoluta* Hubbard	..
,,	*Vossia cuspidata* Griff.	..
,,	*Zea Mays* Linn.	Maize.

Nigerian service in Feb., 1935, before he had completed preparing his notes on the Chad ACRIDIDAE for publication. He has very kindly placed all his data at the writer's disposal; they are included in this paper, which would have been very incomplete without them. The hoppers of the majority of the Chad species do not appear until late June or July, so the writer had but little opportunity to study them during his stay at Kalkala. In addition, many of the Chad species have a prolonged embryonic diapause during the dry season; the adults of some of these species had all died before the writer reached Kalkala in Dec., 1932. He had encountered some of them during an earlier visit to the Chad area in Sept.–Nov., 1931.

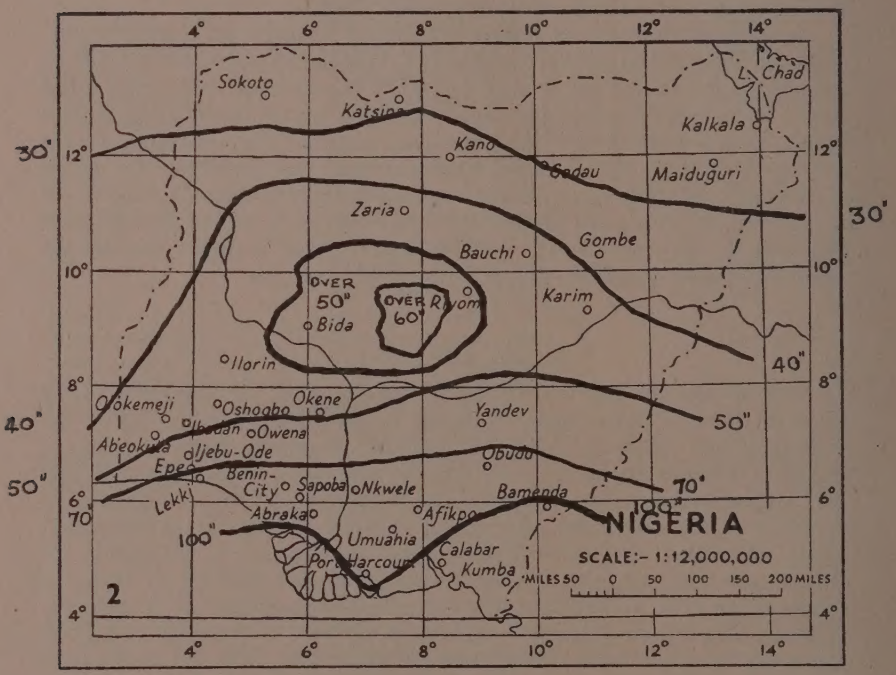
As many as 25 of the 63 species recorded at Ibadan were extremely rare. Although many collections have been made at Owena by the writer and others, only 32 species have been found; as might be expected, the "true forest zone" is less rich in species than any other area, except possibly the Coastal Strip. In this latter locality collecting was confined almost entirely to the dry season (Nov. to Jan.). It will be remembered that Lloyd took 58 species at Sherifuri; of 40 species collected by Nash at Gadau, about 11 miles south of Sherifuri, 16 were not included in Lloyd's collection, so the total for that district is 74. It seems that the Sahelian Zone is richest in species, and that the numbers diminish progressively the farther south one goes.

(b) *Vegetation.*

Kalkala.—Gwynn and the writer (7) have described the vegetation of the Nigerian shore of Lake Chad, whilst the writer (5) has given a rather full account of the different habitats at Kalkala. Generally speaking, belts of grasses of different species run parallel to the lake shore. The wettest habitats are *Vossia*, *Echinochloa*, *Brachiaria* and *Cynodon*, whilst the driest are *Cymbopogon*, *Peristrophe* and old farmland (on which *Pulicaria* is the commonest weed). The delta of the river Yedseram lies about a mile to the east of the village, and is covered with dense *Brachiaria*, which extends inland along the course of the river. Gwynn used the term "inland habitats" to describe the drier habitats, composed largely of old farmland, lying to the south of Kalkala and away from the Lake. Each autumn Lake Chad rises and floods large areas to the south and south-west; flooding begins in September and reaches its maximum soon after mid-December. The floods vary greatly in extent from year to year and their effect on the vegetation is naturally profound. When the writer visited Kalkala in February, 1937, he found that 11 of the 12 square miles of the survey area were still under water and that the new village was on an island (the Kalkala mentioned in this paper was inundated in 1935 and a new village was built a mile farther inland; this was also inundated in 1938). On his last visit to this area in February, 1943, the writer found that, following two dry years, the maximum flood level was as much as $1\frac{1}{2}$ miles short of the original village. On both occasions the changes in vegetation made it difficult to recognize the area as being the same as that in which six months were spent in 1933. In years of extensive floods *Cyperus* spp. and hygrophilous grasses replace the *Cynodon* belt, whilst *Cynodon* occupies those parts of the *Cymbopogon* belt which have been reached by the floods. In dry years the area

under *Cymbopogon* is greatly increased. The effect of these vegetative changes upon the Acridid population is considerable, quite apart from the effect of the concomitant microclimatic changes.

Ibadan.—The collections at Ibadan were made on Moor Plantation, an area of about 680 acres, nearly all of which is under cultivation (arable land, fruit trees, cacao, palms or grazing), and in the 24 square miles surrounding the Plantation. Much of this surrounding area is farmed, and there are only isolated patches of trees and secondary bush; these patches are described as



Map No. 2.—Mean annual rainfall.

"thick bush" below. Certain species of Acrididae were found only in thick bush or in grass at the sides of paths passing along its edge. The main habitats on the Plantation were *Cynodon* and other short grasses (principally *Dactyloctenium aegyptiacum* and *Sporobolus*), laterite roads partly covered by short grasses, farmland and tall grasses such as *Panicum*, *Pennisetum purpureum* and *Paspalum scrobiculatum*. There were large areas of *P. purpureum* grown as cattle food and either grazed or cut for fodder; *Imperata* was common in these areas. The river Awna forms the eastern boundary, and two small tributaries cross the Plantation from west to east; both these are dry for about half the year, but in low-lying areas their banks support lush grass (chiefly *Panicum* and *Paspalum conjugum*) throughout the year.

(c) *Climate.*

The mean annual rainfall is shown in map No. 2, whilst the distribution of precipitation throughout the year at 10 representative stations is given in Table IV.

TABLE IV.

Station.	Jan.	Feb.	Mar.	Apr.	May.	June.
Maiduguri	0·02	0·01	0·01	0·28	1·52	2·60
Kano	0·01	0·04	0·09	0·42	2·56	4·50
Zaria	0	0·05	0·33	1·35	5·03	6·55
Jos	0·13	0·13	1·11	3·61	7·81	9·27
Yandev	0·37	0·73	1·40	4·10	7·30	7·74
Ibadan	0·42	0·88	3·64	5·49	5·92	7·60
Lagos	1·05	1·54	4·01	5·48	10·72	17·69
Benin	0·76	1·26	3·68	6·65	8·30	12·18
Afikpo	0·67	1·48	2·87	6·48	10·05	10·36
Calabar	1·64	2·83	6·38	7·83	12·67	16·29

Station.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Maiduguri	7·41	8·56	4·06	0·67	0	0
Kano	7·96	12·26	5·50	0·55	0	0
Zaria	8·79	11·73	8·58	1·39	0·04	0·01
Jos	12·77	11·95	8·35	1·60	0·15	0·10
Yandev	5·26	6·91	11·20	9·23	0·60	0·22
Ibadan	6·50	3·25	6·99	6·11	1·67	0·36
Lagos	11·14	2·70	5·54	8·10	2·76	1·03
Benin	11·97	8·31	12·07	9·47	3·06	0·60
Afikpo	10·95	11·20	12·64	9·93	2·15	0·39
Calabar	18·69	17·16	17·09	12·54	7·39	1·83

It will be seen that in the most northerly localities nearly all the rain falls between May and September, whilst August is the peak month. In the south-western area there is a break in the rains in late July or August in most years.

The dry season (October to April) is very severe in the more northerly localities, the arid, north-easterly "harmattan" wind blows for much of the time and the relative humidity sometimes drops to 10 per cent. or less. At Ibadan there are usually periods of "harmattan" in late December and January, and the relative humidity at 14·00 hours may drop to 40 per cent.; but the relative humidity at 8·00 hours is about 90 per cent. throughout the year. In the "true forest zone" the relative humidity at 14·00 hours is seldom less than 60 per cent. in any month, and the annual average is about 75 per cent. as compared with 59·5 per cent. at Ibadan.

Hamilton and Archbold (23) state that "The monsoon penetrates the Guinea lands, its northern limit being called the inter-tropical front (here denoted by I.T.F., which is a quasi-stationary front dividing the monsoon to the south from the E.N.E. winds to the north.) The I.T.F. is a prominent feature of surface charts, and in the dry season lies approximately along latitude 8° N. in the area under consideration, though, of course, it fluctuates slowly from day to day, being found occasionally at the height of the dry season as far north as latitude 13° N. and as far south as below latitude 6° N. when the E.N.E. winds penetrate to the coast of the Gulf of Guinea. The I.T.F. moves

south of Lagos for a few days in most dry seasons." As shown later, the northern limit of some of the "forest" species of ACRIDIDAE appears to be small patches of forest at Oke Onigbin and Omu Aran, two villages in the south of the Ilorin Province (about 8° 13′ N.).

VII. THE SPECIFIC IDENTITY OF CHAD ACRIDIDAE.

Since the publication (in 1934) of the writer's account of his study of the ecology of ACRIDIDAE near Lake Chad (5), Dr. Uvarov has described two of the new species mentioned, and has identified a number of the remaining species. In addition, there have been some changes in both generic and specific names. Before giving the results of the present study it is desirable to record the changes in identifications or nomenclature of the species mentioned in the former paper; these are shown in Table V.

TABLE V.

Name given in 1934.	Name in present paper.
Duronia sp.	*Duronia tricolor* Karny.
Platypterna sp.	*Ochrilidia* sp. n., nr. *acuta* I. Bol.
Mesopsis abbreviatus P.B.	*Mesopsis gracilicornis* Kr.
Pnorisa sp. n.	*Pnorisa carinata* Uv.
Stenohippus sp.	*Stenohippus bonneti* I. Bol.
Aiolopus sp. (2)	*Aiolopus longicornis* Sjöst.
Morphacris fasciata Thnbg.	*M. fasciata* Thnbg. ab. *sulcata* Thnbg.
Trilophidia sp.	*Trilophidia conturbata* Wlk.
Acrypha houyi Ramme	*Acorypha picta* Kr.
Caloptenopsis sp. (1)	*Caloptenopsis insignis clarus* Wlk.
,, sp. (2)	*C. onerosa* Uv. (MS. name).
Catantops saucius Burm.	*Catantops axillaris* Thnbg.
Euprepocnemis spp.	*Euprepocnemis plorans* Charp. and *Euprepocnemis* sp.
Ischnacrida sp. n.	*Sudanacris pallida* Burm.
Ornithacris cyanea tereticollis L. Bol.	*O. cyanea cavroisi* Fin.
Thisoicetrus littoralis Ramb.	*Thisoicetrus harterti* I. Bol.
Tristria sp.	*Tristria pallida* Karny.
Bibulus brunni G.T.	*Bibulus coerulescens* St.

Since 1934 the genus *Aiolopus* has been transferred from the ACRIDINAE to the OEDIPODINAE and the genus *Mesopsis* from the CATANTOPINAE to the ACRIDINAE.

The unidentified species No. 58 (1934; p. 294, table viii), which was abundant at light at Kalkala, belongs to the family TETRIGIDAE (formerly TETRIGINAE, a subfamily of the ACRIDIDAE).

VIII. NOTES ON THE ACRIDIDAE OF NIGERIA.

ACRIDINAE.

(1) *Cannula linearis* Saussure.

(*a*) Fr. Sud., A.E. Sud., Abyss., B.C., Ug., T.T., S. Afr.

(*b*) Lagos, Ibadan, Nkwele, Afon, Lafiagi, Yandev, Zaria, Gadau, Sherifuri. Widely distributed, but absent from Chad and the "true forest zone."

(*c*) Ibadan: 12 adults on 8, 9, 24, 30 Jan.; 12, 13, 16, 27 Mar.; 20 June; 29 July; 9, 29 Aug. Other localities: 8 adults in May to Sept.; Dec.

(*d*) *C. linearis* is elongated and yellowish in colour and bears a strong resemblance to a dry stalk of grass; it is rather sluggish and difficult to find. At Ibadan it was taken in tufted *Panicum* and *Pennisetum purpureum*.

A last instar nymph, collected at Ibadan on 12 Mar., became adult on 28 Mar.; when dropped on the ground the nymph remained completely immobile for nearly a minute. Several nymphs were taken at Nkwele in July, 1937.

(2) *Parga cyanoptera* Uvarov.

(*b*) Gadau, Sherifuri.

(*c*) Lloyd collected 20 adults of this blue-winged species; Nash took two adults at Gadau on 2 and 30 July, 1937. One adult of *P. cyanoptera* var. was found at Yandev on 7 Sept., 1936.

(3) *Parga xanthoptera* St.

(*a*) A.E. Sud., B.C., Ug., Ken., S.Rhod., S. Afr.

(*b*) Lloyd collected 8 adults of the typical yellow-winged form and 2 of the rose-winged ab. *rhodioptera* St. at Sherifuri. One unidentifiable specimen of *Parga* was taken at Kalkala and another at Bauchi.

(4) *Ocnocerus diabolicus* Karsch.

(*a*) Togo.

(*b*) Lloyd collected 18 adults at Sherifuri.

(5) *Amphicremna scalaris* Karsch.

(*a*) Fr. Sud., A.E. Sud., B.C.

(*b*) Chad (Metele to Wulgo), Ibadan, Nkwele, Bamenda, Barakin Ladi.

(*c*) Kalkala: adults seen in every month except May; most numerous in Dec.–Feb. and July–Sept. Ibadan: throughout the year, most numerous in Mar.

(*d*) In the Chad *A. scalaris* is found principally in *Brachiaria*, but also occurs in *Chloris*, *Echinochloa* and *Cynodon*; evidence was obtained that there is a gradual migration lakewards as the inland *Brachiaria* becomes dry (in March).

Fourteen nymphs, usually large, were seen between 1 Jan. and 2 Mar., and four were observed between 10 and 26 June. Gwynn found hoppers in every month from June to Nov.; they were most abundant in July and October. It seems probable that there are two generations in the year.

This rather inconspicuous species is probably widely distributed outside the "true forest zone." It occurs in tufted *Panicum* and *Pennisetum purpureum* at Ibadan; during the dry season (Nov.–Feb.) it is most commonly seen in *Panicum* bordering streams.

Nymphs have been taken in Oct. and Dec. to Mar.; a number of last instar hoppers were observed on 1 Mar., 1946, and it is evident that a generation became adult during that month. Two caged adults were *in coitu* on 13 May.

(6) *Acridella* spp.

The taxonomy of this genus is in need of revision, and none of the five species taken in the Chad area have been identified. The writer found only 14 adults (belonging to three species) during the first Kalkala survey; all were taken between 5 Apr. and 30 June. The following notes are based on Gwynn's observations and collections; he was also responsible for separating tentatively the various species of this difficult genus.

(i) *Acridella* sp. cf. *nasuta* L.

A rather small species taken between Gusko and Kalkala; the wings of the females are crimson with blue bases, and those of the males are yellowish. Commonly found on old farmland, and the only species of *Acridella* not frequenting tall grass. Twenty-four adults collected between 18 Aug. and 6 Dec., most abundant in August. Five nymphs seen on 19 Aug., 1934.

At light.—Kalkala, 19 Nov.

Uvarov (13) identified specimens of *Acridella* taken by Lloyd at Sherifuri as *nasuta* L.; this is the only Nigerian record known to the writer of this genus occurring outside the Chad area.

Guichard collected one adult at Yao (Tchad) on 24 Dec., 1944.

(ii) *Acridella* sp. cf. *pharaonis* Klug.

A large species taken in *Cymbopogon* at Kalkala; the wings of both sexes are crimson in colour. Twenty-seven adults were found between 31 May and 12 Sept.; they were most abundant between mid-June and mid-August. Nymphs were seen on 13 June, 16, 23, 25, 26 July and 7 Aug.; they were common on 16 and 23 July.

At light.—Kalkala, 11 June.

(iii) *Acridella* sp. cf. *procera* Klug.

A large species taken in *Cymbopogon* at Kalkala; the wings of both sexes are either blue, purple or violet in colour. Twelve adults were collected between 5 Apr. and 7 Aug.; they were most numerous in late May and early June.

Teneral adults: on 5 (2) Apr. and 10 May, 1933, see Golding (5).

(iv) *Acridella* sp. 4.

One male taken by the writer on 22 June, 1933, and one female collected in *Cymbopogon* by Gwynn on 2 June, 1934; both at Kalkala.

(v) *Acridella* sp. 5.

A very large species found in *Cymbopogon* and *Chloris* at Kalkala; the wings of the females are crimson with blue bases. No males were found. Gwynn took seven females, all in grass remote from the Lake, between 19 Sept. and 21 Oct., 1933. The writer collected one female at Gumnari on 27 Sept., 1931.

It is evident that all five species of *Acridella* have an embryonic diapause during the dry season.

(7) *Acrida* spp.

The systematics of this genus also require revision. There are at least two species in the Chad area and two other species elsewhere.

(i) *Acrida* sp. 1.

A very common species occurring in the littoral area between Baga Seyoram and Wulgo. Adults were present throughout the year and were most abundant

in Jan.–Feb. and July. Specimens were found in every habitat, but they were most numerous in *Brachiaria* and *Cynodon*. This species exists in three colour forms, brown, green and green with two lateral brown stripes; the green form is associated with humid conditions. The sex ratio was 594 ♂ to 100 ♀.

Nymphs were found in every month of the year; they were most abundant in June–July and Sept. A generation hatches out during May and a second in about Sept.

(ii) *Acrida turrita* L.?

(*a*) G.C., A.E. Sud., B.C., Ug., Nyasa., S. Rhod., S. Afr., S. Europe, Asia, Australia.

Two specimens, taken at Mongonu on 28 Sept., 1931, and at Zaria on 4 July, 1931, were identified as *A. turrita* by Dr. Uvarov. Between 18 Aug. and 21 Oct., 1934, Gwynn found (at Kalkala) several adults of a second species which was probably *turrita*.

(iii) *Acrida sulphuripennis* St.?

(*a*) Fr. Sud., B.C., Ug., Ken., S. Rhod., S. Afr.

Specimens taken at Ibadan many years ago were identified as *sulphuripennis*; but there are two species present in that locality and elsewhere in the southern part of Nigeria. *Acrida* has been taken in nearly every locality; but owing to the difficulty of identifying the various species the data are not worth recording. Adults are seen throughout the year at Ibadan, principally in *Cynodon*; nymphs have been recorded in Jan., May, June and Sept.-Dec., and teneral or bred adults in May, June, Aug. and Oct.–Dec.

(8) *Glyphoclonus miripennis* Karsch.

(*a*) Togo., B.C., Nyasa.; data incomplete.

One specimen of this striking black species, with red and black wings, was collected in tall grass at Oyo on 8 May, 1946.

(9) *Machaeridia bilineata* St.

(*a*) S.L., B.C., Ug., T.T.

(*b*) Sapele, Ibadan, Olokemeji, Oke Onigbin, Ilorin, Lafiagi, Bauchi.

(*c*) Ibadan: 10 adults on 28 Jan.; 12, 13, 16, 17 (2) Mar.; 28 Apr. and 1 (2), 26 May. Other localities: 10 adults in Apr., May, July, Aug., Dec.

(*d*) This rather inconspicuous species is widely distributed, but absent from the Chad area. It is usually found in tufted grassland or tall grass areas which have recently been burnt.

(10) *Calephorus venustus* Walker.

(*a*) S.L., B.C., Ug., T.T.

(*b*) Chad (Baga Seyoram to Mafindere). Sokoto, Kano, Fika, Kalkala: all these localities are north of 11° 14′ N.

(*c*) Kalkala: Adults present throughout the year, most numerous between July and Jan.

(*d*) This species is almost always found in *Cynodon*. Nymphs have been taken in every month except March; they were abundant in Apr. and Sept.–Nov., and there are probably two generations in the year.

(11) *Duronia tricolor* Karny.

(*a*) Fr. Sud., Fr. Tch., A.E. Sud., Ug., Kenya, T.T.

(*b*) See map No. 3; north of 8° 29′ N.

(*c*) Kalkala: Seen in every month from June to Feb.; commonest in Sept. and Oct. Other localities: Apr.–July and Sept.–Dec.

(*d*) At Kalkala *Duronia* is found principally in *Brachiaria* and *Chloris*. Adults were numerous in a marsh at Ilorin on 26 Apr., 1942. In the Chad area Gwynn found 5 nymphs in June, 44 in Sept. and 6 in Oct.; there is probably an embryonic diapause from about Nov. to Apr. in Chad.

At light.—Kalkala, 18, 20 Jan., 18 (3) June; Maiduguri: 21 (3) May.

Map No. 3.—Distribution of × *Duronia tricolor* Karny and ○ *Holopercna gerstaeckeri* I. Bolivar.

(12) *Paracomacris pharaonis* Karny.

Gwynn collected two adults at Kalkala, one in *Brachiaria* on 27 June, 1934, and the other at light on 13 Aug., 1934.

(13) *Paracomacris producta* Walker.

(*a*) S.L., G.C., I.C., Fr. Tch., Ug.

(*b*) Widely distributed, but not common to the north of 8° 30′ N. Very rare at Kalkala, where it was not encountered during the surveys of 1932 to 1934.

(*c*) Ibadan : Adults present throughout the year, the most abundant local species.

(*d*) *P. producta* occurs in *Cynodon* and other short grass habitats. Nymphs are present throughout the year ; teneral adults on 19, 23 (6) Apr. and 27 Aug. ; 53 adults bred in following months : May (5), June (2), July (16), Aug. (17), Sept. (6), Oct. (3), Nov. (3), Dec. (1). There are presumably two or more generations in the year.

(14) *Sherifuria haningtoni* Uvarov.

Hanington (13) collected two males at Sherifuri in 1924. The writer found this species to be common at Karin in Sept., 1941, and also took a specimen at Mutum Daya in the same month.

(15) *Rasperecta* sp.

One specimen was taken by the writer at Bode Sadu on 1 May, 1937.

(16) *Orthochtha bisulcata* Krauss.

(*a*) Fr. Sen., Fr. Sud., Fr. Guin.

(*b*) Sherifuri, Bauchi, Zaria.

One of the commonest species at Sherifuri (13) ; one specimen from Bauchi (14 May, 1942) and one from Zaria (17 July, 1931).

(17) *Orthochtha brachycnemis* Karsch.

(*a*) Togo., B.C.

(*b*) Epe, Olokemeji, Ibadan, Oyo, Nkwele, Umuahia.

(*c*) Ibadan : throughout the year. Other localities : May–July and Sept.

(*d*) A common species at Ibadan, found in young tufted *Panicum* and *Pennisetum purpureum*. Nymphs seen Jan.–Mar. ; teneral adults on 1 Mar., 30 Apr., Sept., 5 Oct., 5, 15 Nov. ; adults bred on 12 Mar., and 7, 11 May. There are probably two generations in the year, one becoming adult in Mar.–May and the other in Sept.–Nov. In the dry season most often encountered in grass bordering streams.

(18) *Orthochtha pachycerca* Karny (?).

In Sept., 1941, the writer collected two specimens at Karin and one at Mutum Daya. Seven more adults were taken by locust scouts in marshes bordering the River Benue, near Yola, in Nov. and Dec., 1946.

(19) *Orthochtha* sp. n.

(*b*) Chad (Gusko to Kalkala).

(*c*) Kalkala : Gwynn found adults between 25 July and 15 Nov. ; the writer collected an adult on 5 Jan., 1933 ; they were most abundant between 8 Aug. and 19 Sept.

(*d*) A common species found mainly in *Brachiaria* and *Chloris*. Gwynn collected nymphs between 18 July and 19 Sept. ; they were numerous in early August. There is evidently an embryonic diapause from about October to early July.

(20) *Macrocymochtha speciosa* Sjöstedt.

(*b*) Kalkala.

(*c*) Kalkala: 17 Sept. to 2 Feb., most numerous between 19 Sept. and 22 Oct. The writer collected three adults on 5, 9 Jan. and 2 Feb.; these are recorded as *Orthochtha* sp. nov. in a previous paper (5); all the remaining data on this species were obtained by Gwynn.

(*d*) A common species frequenting *Chloris*, but on one occasion Gwynn found *M. speciosa* to be abundant in a *Brachiaria-Echinochloa* river marsh. Nymphs were taken between 8 Aug. and 16 Oct. (only one was seen after 24 Sept.). There is undoubtedly an embryonic diapause from about November to July.

(21) *Kraussella amabile* Krauss.

(*a*) Fr. Sen., Fr. Sud., A.E. Sud., Abyss.

(*b*) Zaria, Kano, Nahuce, Sherifuri, Kalkala; all to the north of 11° N.

(*c*) Kalkala: Gwynn found 28 adults between 17 Sept. and 22 Oct. Other localities: 10 Sept.–21 Oct.

(*d*) In Kalkala this species occurred in *Brachiaria* and *Chloris*. Gwynn found nymphs on 18 (2) and 25 (2) July; one of these became adult on 3 Aug. There is evidently an embryonic diapause from about October to June. Gascoigne reported that adults were attacking Bulrush Millet at Nahuce.

(22) *Zacompsa bivittata* Uvarov.

Lloyd collected 3 adults of this brachypterous grasshopper at Sherifuri; Gwynn took one female in *Brachiaria* at Kalkala on 24 Sept., 1934, and a second female in *Andropogon* at Kasa on 30 Oct., 1934.

(23) *Zacompsa bivittata karschi* Ramme.

The writer collected four adults of this macropterous subspecies at Karim and Gidan Usumanu in late Sept., 1941; Gwynn took one female at light at Kalkala on 30 Aug., 1934.

(24) *Zacompsa festa* Karsch.

(*a*) S.L., Togo.

(*b*) Ibadan, Olokemeji.

(*c*) Ibadan: 18 adults on 21 Apr.; 11, 26 May; 1, 7 (2), 16, 22, 25 (2) June; 26 (2), 29 (2) July; 3 Aug.; early Sept. 8, 19 Oct. Olokemeji: 22 May; 24, 25, 26 Nov.

(*d*) This species was common on grass growing in rides in the Forest Reserve at Olokemeji in late Nov., 1936. At Ibadan it occurs in grass both bordering paths through thick bush and near the River Awna.

(25) *Chirista compta* Walker.

(*a*) S.L., G.C., B.C., Ug., Ken.

(*b*) Widely distributed south of 10° N.

(*c*) Ibadan: throughout year, common in late May and Oct.–early Nov.

(*d*) During the rains *C. compta* occurs in *Cynodon* and other short grass habitats, in the dry season it is most frequently seen in *Paspalum conjugum* growing near streams. Gravid females on 3 Mar. and 9 Sept.; teneral adults on 25 May, 1, 5 June, 23 Sept. and 23 Dec.; adults bred on 15 July, 15, 27 Aug., 1 (2), 15, 20, 21 (2) Sept. and 10, 12 Oct. There are probably two generations during the rains.

Adults were abundant in late April at Esosong, near Kumba, and in June–July at Umuahia.

(26) *Holopercna gerstaeckeri* I. Bolivar.

(*a*) G.C., Gabon, B.C.

(*b*) See map No. 3; found to the south of 8° 15′ N.

(*c*) Ibadan: 9 adults on 13 May, 30 June, 4 (3) Aug., 5, 7 Oct. and 7, 20 Nov. Other localities: May–Jan.

(*d*) This species was found in thick vegetation bordering rivers and streams at Oro, Ibadan and Nkwele; elsewhere it occurred in either forest or thick bush. The three adults taken at Ibadan on 4 Aug., 1939, were on *Costus*. Nymphs have not been found; there is probably an embryonic diapause during the dry season.

(27) *Rhabdoplea mira* Karsch.

(*a*) Togo.

(*b*) Two adults were taken at Ibadan on 21 Mar. and 5 June, 1946; the first was in *Panicum*. The adults of this brachypterous species resemble hoppers in appearance; for this reason they are unlikely to be taken by the uninitiated collector.

(28) *Gymnobothrus longicornis* Ramme.

The writer took two adults at Oke Onigbin on 5 and 6 July, 1939.

(29) *Gymnobothrus temporalis* St.

(*a*) Fr. Sud., S.L., B.C., A.E. Sud., Ug., Ken., T.T., S. Rhod.

(*b*) Ibadan, Oyo, Bamenda, Bauchi, Gadau, Sherifuri. Widely distributed, but absent from Chad and the "true forest zone."

(*c*) Ibadan: 9 adults on 9, 24 Jan., 16, 17 Mar., 21, 28 Sept. and 9 (2), 10 Oct. Other localities: 8 adults between Apr. and Oct.

(*d*) At Ibadan one adult was found in a cotton field and another in *Pennisetum purpureum*.

(30) *Brachycrotaphus lloydi* Uvarov.

(*a*) Fr. Cam.

(*b*) Lloyd took 4 adults at Sherifuri.

(31) *Brachycrotaphus karschi* Uvarov.

(*a*) Ug.

(*b*) Lloyd collected 7 adults at Sherifuri.

(32) *Brachycrotaphus steindachneri* Krauss.

(*a*) Fr. Sen., Ug.

(*b*) Nkwele, Ilorin, Oke Onigbin, Share, Bode Sadu, Karim, Bakura, Gadau, Kalkala; widely distributed outside the forest zone.

(*c*) All localities: taken in Feb., Apr., May, July–Sept. and Dec.; not uncommon in Ilorin Province. Gwynn took one adult at Kalkala.

(33) *Brachycrotaphus tryxalicerus* Fischer Waldheim.

(*a*) Fr. Sen., Fr. Sud., Sicily, Spain.

(*b*) Karim, Mutum Daya, Fika, Gadau, Sherifuri, Kalkala; north of 9° 18′ N. and east of 10° E.

(*c*) Kalkala: Gwynn took 10 adults on 2, 12 July, 6 Aug., 19 Sept., 16 (3), 22 Oct. and 14 (2) Nov.; Iwenjora collected one in Feb. Other localities: Feb. and July–Sept., not common.

(*d*) Occurs mainly in *Chloris* and *Imperata* at Kalkala. Gwynn caught a fourth instar nymph in *Cynodon* on 19 Sept., 1934.

(34) *Mesopsis gracilicornis* Krauss.

(*a*) Fr. Sud., G.C., A.E. Sud., Ug., T.T.

(*b*) See map No. 4: widely distributed, but absent from the Forest Zone.

(*c*) Kalkala: adults found in every month except Mar. and Sept., most numerous in June–Aug. Other localities: 7 adults in Apr., July, Sept. and Nov.

(*d*) At Kalkala this species is found most frequently in *Cynodon* and *Chloris*. Its distribution is of great interest as it occurs in the strip of Guinea Savannah to the west of Abeokuta and at Lagos, although it has never been found in the Forest Zone to the east. Nymphs have been captured in every month except Apr., May and Sept.; they are most common in June–Aug.

(35) *Mesopsis laticornis* Krauss.

(*a*) Fr. Sen., Fr. Sud., S.L., Fr. Tch., A.E. Sud., B.C., Ug., Ken., T.T., S. Afr.

(*b*) Sherifuri, Maiduguri, Chad (Abeli Ashettammari to Wulgo).

(*c*) Kalkala: adults taken throughout the year; most abundant from Oct. to May.

(*d*) At Kalkala this species occurs most often in *Chloris*. Nymphs have been found in early Mar., June, and Aug.–Nov. The main generation becomes adult in October. Burtt and Uvarov (2) state that, in Tanganyika, this species occurs "in two colour forms, one with perfectly hyaline hind wings and another with the wings bearing a large black spot at their base; . . ." and that "the hyaline forms are prevalent in the early dry season, but are replaced by the infuscate ones at the beginning of the next rainy season." These authors suggest that "the pigment metabolism in *Mesopsis* may be connected with sexual maturation, since many Acrididae of tropical African grasslands remain adult throughout the dry season, becoming sexually mature at the onset of the rains." All the adults collected by the writer between Dec., 1932, and 30 June, 1933, had hyaline wings; unfortunately none of the specimens taken by Gwynn during the rains is in the reference collection at Ibadan.

(36) *Ochrilidia nubica* Werner.

(*a*) A.E. Sud.

(*b*) Chad (Kalkala, Abeli Ashettammari). Gwynn took one adult at light at Kalkala on 4 Nov., 1933, and three at Abeli on 22 Dec., 1933.

(37) *Ochrilidia* sp., nr. *nubica* Werner.

(*b*) Chad (Baga Seyoram to Kalkala).

(*c*) Adults found from Mar. to Dec., most numerous in Aug.

(*d*) The favourite habitat of this species is mixed *Cymbopogon* and *Cynodon*. Gwynn captured 3 nymphs in August.

Drawn & Reproduced by Land & Survey Dept. Nigeria; 1946.

Map No. 4.—Distribution of × *Mesopsis gracilicornis* Kr. and ○ *Catantops simplex* Uv.

(38) *Ochrilidia* sp., nr. *acuta* I. Bolivar.

(*b*) Chad (Baga Seyoram to Mafindere), Maiduguri.

(*c*) Kalkala: taken in every month except Jan.; most numerous in May and Aug.–Oct.

(*d*) A common species occurring most often in *Cynodon*, *Sporobolus* sp. and *Chloris*. Nymphs present throughout the year, most abundant in Feb., Apr.–May and Aug.; probably two generations in the year.

At light.—Kalkala, 18 (2) June; Maiduguri, 21 (5) May.

(39) *Ochrilidia* sp. 4.

One female taken at Mongonu by the writer on 28 Sept., 1931.

(40) *Ochrilidia* sp. 5.

(*a*) A.E. Sud.

(*b*) One female taken at light at Kalkala by Gwynn on 20 Oct., 1933.

(41) *Platypternodes savannae* Uvarov.

(*a*) Fr. Sud.

(*b*) Bida, Sokoto, Sherifuri, Chad (Gusko, Kalkala, Mafindere) to the north of 9° N.

(*c*) Kalkala: adults taken between 29 May and 9 Aug.; most numerous in July. One collected at Bida on 2 June and one at Sokoto on 17 June.

(*d*) At Kalkala this species is found most often in *Chloris* and *Cymbopogon*. Gwynn found 8 nymphs on 4 and 5 June, 1934; the writer caught a last instar nymph on 12 June and three teneral adults on 10 June, 1933. There is probably a very lengthy embryonic diapause from about Aug. to Apr.

(42) *Azarea lloydi* Uvarov.

Lloyd collected 14 adults at Sherifuri and Lee one at Yola.

(43) *Eleutherotheca fungosa* I. Bolivar.

Three adults were taken at Bauchi on 9, 12 and 13 May, 1936, and two at Zaria on 20 and 30 May, 1938.

(44) *Eleutherotheca* sp.

Bumpus took two specimens at Bamenda in May, 1946.

(45) *Pnorisa carinata* Uvarov.

(*a*) Fr. Sud., A.E. Sud.

(*b*) Chad (Abeli Ashettammari to Kalkala), Maiduguri.

(*c*) Kalkala: 16 adults seen in Jan. to June; 12 in Oct. Gwynn collected 5 adults at Abeli in Dec.

(*d*) *P. carinata* was found most often in *Cymbopogon* and *Chloris*. Gwynn saw nymphs on the following dates: 19 Aug., 17 (4) Sept. and 22 Oct. It is evident that a generation becomes adult during Oct.; oviposition probably takes place during July.

At light.—Kalkala, 13 May, 21 Oct. and 7 Nov.

(46) *Pnorisa squalus* Stål.

(*a*) Fr. Tch., A.E. Sud., Ken., T.T., S. Rhod., S. Afr.

(*b*) Barakin Ladi, Zaria, Sherifuri, Chad (Baga Seyoram to Wulgo); all north of 9° 30′ N.

(*c*) Kalkala: found in every month from Oct. to June.

(*d*) Occurs in two forms, typical and striped, the first is about three times as numerous as the second; similar forms are present in *P. carinata*. *P.*

squalus is found most frequently in *Cynodon*, *Chloris* and old farmland at Kalkala. Gwynn found nymphs between 6 Aug. and 21 Oct.; they were most abundant in Sept. The writer captured a gravid female on 10 June, 1933. A generation becomes adult during Oct.; oviposition probably takes place in late June.

(47) *Berengueria bifoveolata* Karsch.

(*a*) A.E. Sud.

(*b*) Ibadan, Ilorin.

(*c*) The writer took 3 adults at Ibadan on 13, 16 Mar. and 19 Apr. and one at Ilorin on 24 Apr.; all were in a tall grass habitat which had been burnt some weeks previously.

(48) *Stenohippus aequus* Uvarov.

(*a*) A.E. Sud.

(*b*) Lloyd collected 9 adults at Sherifuri.

(49) *Stenohippus bonneti* I. Bolivar.

(*b*) Chad (Kalkala, Kauwa, Mongonu).

(*c*) Only 22 adults seen—in every month from Mar. to Sept. and in Nov.

(*d*) Of the 16 adults recorded by Gwynn, 10 were at light; he has pointed out that many of the species which are rare at Kalkala occur at light. The other records come from distant localities, and Gwynn considers that their presence at Kalkala was casual and possibly occurred during times of migration or dispersal. Gwynn found a last instar hopper at Kauwa on 19 Aug. and a teneral adult at Kalkala on 17 Sept.

At light.—Kalkala, 13 (3) June, 13 (3) July, 10 (2) Sept. and 4 (2) Nov.

(50) *Stenohippus gracilis* Werner.

(*a*) A.E. Sud.

(*b*) Chad (Baga Seyoram, Kalkala).

(*c*) Only 11 adults seen; Gwynn found 10 between 3 Oct. and 18 Dec., and the writer one on 5 Jan. Six were in *Cynodon*.

(51) *Stenohippus xanthus* Karny.

(*a*) A.E. Sud., Ug., Ken.

(*b*) Lagos, Abeokuta, Nkwele, Share, Bode Sadu, Bambar, Gadau, Sherifuri; absent from Chad and the whole of the Forest Zone.

(*c*) All localities: 9 adults in Apr. to July, Sept. and Nov. Uvarov (13) mentions a long series of both sexes from Northern Nigeria; presumably most of these were collected by Lloyd at Sherifuri. Three of the 9 adults mentioned above were taken by Dr. Nash at Gadau, about 11 miles south of Sherifuri.

(*d*) The distribution of this species is of interest, and comparable to that of *Mesopsis gracilicornis*.

(52) *Aulacobothrus invenustus* Karsch.

(*a*) Togo.

(*b*) Lloyd took one adult at Sherifuri.

(53) *Aulacobothrus punctatus* Uvarov.

(*b*) Bauchi, Gadau, Sherifuri.

(*c*) Four adults at Bauchi on 5, 9, 12 and 13 May, one at Gadau on 30 July.

(54) *Aulacobothrus wernerianus* Karny.

(*a*) Fr. Sud., A.E. Sud., T.T.

(*b*) Bauchi, Gadau, Sherifuri.

(*c*) One adult at Bauchi on 13 May and one at Gadau on 2 July.

(55) *Leva* sp.

The writer caught one adult at Ibadan on 6 Oct., 1937.

(56) *Jasomenia dimidiata* Bolivar.

(*a*) B.C., Ken., S. Rhod.

(*b*) Nash took 3 adults at Gadau on 29 July, 1937.

(57) *Paracinema luculenta* Karsch.

(*a*) S.L., G.C., Togo., B.C.

(*b*) Epe, Isoba, Abraka, Ibadan, Owena, Oshogbo, Oke Onigbin : all south of 8° 13′ N.

(*c*) One adult at Ibadan on 14 Oct., 1937. Other localities : 16 adults in the following months : Apr. (2), May (8), June (3), Aug. (1) and Dec. (2).

(*d*) This species occurs in lush grass. One nymph was found at Owena on 16 Aug., 1939.

(58) *Paracinema tricolor* Thunberg.

According to Key (9) specimens taken by Booth and Strachan at Lagos many years ago are close to *P. t. tricolor* Thnbg., whilst those collected by Gwynn and the writer in the Chad area are either typical *P. t. sudanensis* Key or intermediates between the two subspecies mentioned above. Key gives the distribution of *P. t. tricolor* as the whole of Africa south of 10° N. (except for Abyssinia and the extreme south of the Union of South Africa), and that of *P. t. sudanensis* as the strip of savannah and semi-desert country extending right across the continent between the northern limit of *P. t. tricolor* and the Sahara. Unfortunately the writer has not encountered this species between Gadau (11° 50′ N.) and Ilorin (8° 29′ N.).

(i) *P. t. sudanensis* Key (and intermediates).

(*b*) Gadau, Ingawa, Sokoto, Chad (Baga Seyoram to Mafindere).

(*c*) Kalkala : adults seen throughout the year ; common in May and in Sept.–Oct.

(*d*) This species was most often encountered in the wetter parts of the *Brachiaria* areas ; it also occurred in *Echinochloa*, *Vossia* and *Sorghum aethiopicum*. Adults were frequently found on grass growing in several feet of water ; their hind tibiae are adapted for swimming. Nymphs were collected in every month from Apr. to Oct. and in Dec. ; they were most abundant in Apr.–early

May and Aug.–Sept. The writer captured teneral adults on 10, 25 Apr. and 26 June. There are at least two generations in the year.

At light.—Kalkala, 18 (2) Jan.

(ii) *P. tricolor*, nr. subsp. *tricolor* Thnbg.

(*b*) Lekki, Epe, Lagos, Ilorin.

(*c*) One adult in a marsh at Ilorin on 4 May, 1937 ; one at Epe on 10 May, 1946 ; one at Lagos on 23 Dec., 1937, and about a dozen at Lekki on 14 Dec., 1937.

Oedipodinae.

(59) *Aiolopus savignyi* Kr. (*affinis* I. Bolivar.).

(*a*) A.E. Sud., India, Egypt, Arabia.

(*b*) Barakin Ladi, Gadau, Chad (Gumnari, Kalkala, Wurge).

(*c*) Chad : three adults taken by the writer in Feb. and May, 15 collected by Gwynn between 23 June and 16 Oct.

(*d*) This species occurred most often on farmland. Gwynn took teneral adults on 6 (2) and 18 July.

(60) *Aiolopus longicornis* Sjöstedt.

(*a*) Ug., Ken., T.T.

(*b*) Kalkala.

(*c*) Five adults were taken by Iwenjora (two) and the writer (three) on 13 (2), 19 (2) Feb. and 3 Apr.

(61) *Aiolopus* spp.

There is a widely distributed species of *Aiolopus* with a black band on the hind tibia and a reddish area at its distal end ; some individuals are partly green in colour. These green adults were formerly tentatively identified by Uvarov as *thalassinus* F., whilst the others were called *Aiolopus* sp.; it now seems probable that both are the same species. The writer's records include references to at least one other unidentified species ; in view of the taxonomic difficulties in this genus and the fact that the data may refer to two or more species it is useless to give them in full.

(i) *Aiolopus* sp. 1.

A common species in Chad (Gusko to Wulgo), usually in the wetter parts of the *Brachiaria* habitat and in *Echinochloa*. Adults seen in each month from Jan. to Oct., most abundant in Sept. Gwynn found nymphs on 19 (5) June and 19, 26 July, and teneral adults on 18 Aug. and 15 Sept.: the writer bred an adult on 8 May.

At light.—Kalkala, 18 (2) June.

(ii) *Aiolopus* sp. 2.

At Ibadan there is a species (possibly the same as the above) which has been taken in the following months : Jan. (1), Feb. (3), Mar. (2), Apr. (5), May (2), June (3), Nov. (21), and Dec. (3). It occurs either in *Cynodon* or on roads partly covered with *Cynodon* or *Eleusine indica*. Teneral adults were seen on 5 Mar. and 13, 30 Apr.; copulation was observed on 14 Nov. It seems probable that there are two generations in the year, one becoming adult in

Mar.–Apr. and the other in Nov. This species is widely distributed, but does not appear to be very common.

(62) *Aulocaroides leroii* Werner.

(*b*) Chad (Kalkala, Wurge) and Kasa.

(*c*) Gwynn took three adults in 1934, one at light at Kalkala on 10 Sept., one at Wurge on 24 Oct., and one in *Andropogon* at Kasa on 30 Oct.

(63) *Lerina nigerica* Uvarov.

(*a*) Fr. Sud., G.C.

(*b*) Lloyd took 4 adults at Sherifuri.

(64) *Pycnodictya diluta* Ramme.

(*b*) Oke Onigbin, Okene, Zaria.

(*c*) Only 5 specimens have been taken, two on unknown dates between late May and 20 Aug. and the remaining three on 18 June and 5, 24 July.

(65) *Morphacris fasciata* Thunberg., ab. *sulcata* Thunberg.

(*a*) Morocco (Atlas), Fr. Sud., S.L., G.C., A.E. Sud., B.C., Ken., S. Rhod., India. All the many Nigerian specimens seen by the writer belong to the yellow-winged form *sulcata*; the typical red-winged form has never been found.

(*b*) Very widely distributed, but not common to the north of 12° N.

(*c*) Ibadan: throughout the year, most numerous from Aug. to Dec., rare from Jan. to May. Chad: only 20 adults seen; in every month except Apr. and Nov.

(*d*) At Ibadan *M. f. sulcata* is found in *Cynodon* and other short grass habitats, and on paths and farmland; both adults and nymphs attack maize occasionally. Nymphs have been taken from Feb. to June and from Sept. to Nov.; teneral adults on 24 Mar., 10, 13, 15, 16, 18 (2) Apr., 30 May, 30 Aug. and 18 Dec.; adults bred on 3 May, 3 June, 9 (2), 15 (2) Aug., 1 Sept. and 12 Oct.; *coitus* seen on 4 Oct. and 9, 21 Nov.; gravid females on 15, 17, 25 Aug., 9 Sept., 12, 13 Nov. and 9, 20 Dec. There appear to be two generations in the year, one becoming adult in the early rains (Mar.–June) and the other in the autumn. On one occasion a female was seen in flight whilst coupled with a male.

At Kalkala, Gwynn found two last instar hoppers on 15 Sept. and the writer saw a few nymphs between Jan. and Mar. The writer took adults at light on the following dates in 1933: Kalkala, 25, 27 May; Maiduguri, 21 (5) May; the rains started on May 14th.

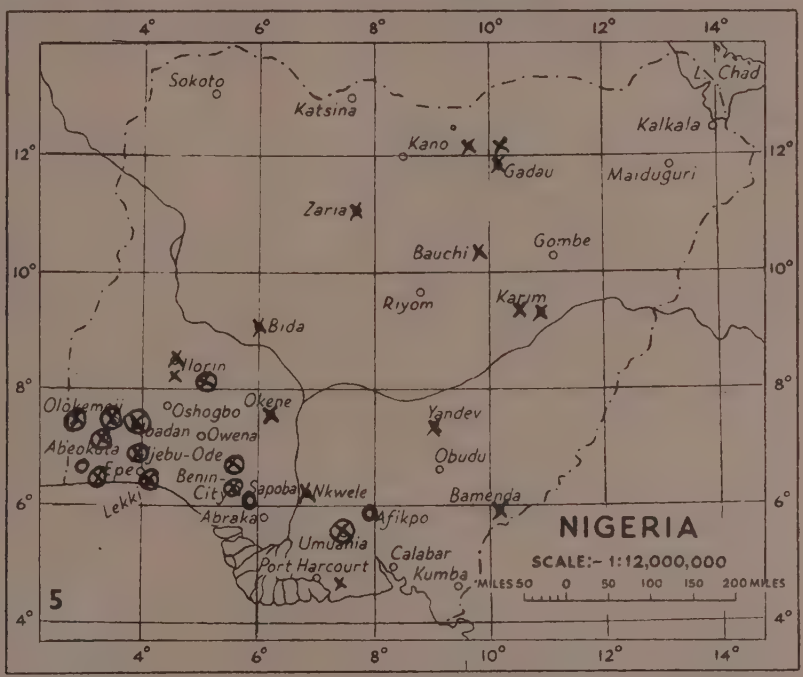
(66) *Heteropternis couloniana* Saussure.

(*a*) S.L., G.C., Ug., Ken., T.T., S. Rhod.

(*b*) See map No. 5; confined mainly to the Forest Zone; never seen to north of 8° 13′ N.

(*c*) Ibadan: only 29 adults seen between 23 Mar. and 11 Oct., most numerous in June–mid-July and in Sept. Other localities: Jan., Apr.–July, Sept., Nov., Dec.

(*d*) Only four specimens have been taken outside the Forest Zone ; one of these was in a patch of forest at Oke Onigbin, one at Meko and two in the Coastal Belt. Oke Onigbin has already been shown to be the northern limit of *Paracinema luculenta*, as it is of two other " Forest " species listed later in this paper. At Ibadan two nymphs were found by a river on 5 Apr. and a third was taken on 7 June ; teneral adults on 11 Apr., 7 June and 28 July ; adults bred on 11 Apr., 12 May and 1 Sept.; a gravid female was found on 30 Sept. It seems probable that there is an embryonic diapause from about



Map No. 5.—Distribution of × *Heteropternis thoracica* Walk. and ○ *H. couloniana* Sauss.

Oct. to March, and that there are two generations during the rains. It is of interest that adults have been found in Dec. in the Coastal Belt, and in Jan. at Owena ; it is probable that the autumn-bred adults survive longer in these areas on account of the higher atmospheric humidity. *H. couloniana* is usually on grass-bordered paths and forest rides. It was abundant at Umuahia in early July, 1939.

A red-winged variety was taken at Ibadan on 22 May, 1939, and at Afikpo on 27 Apr., 1942.

(67) *Heteropternis thoracica* Walker.

(*a*) Fr. Sud., S.L., A.E. Sud., B.C., Ug., Ken., S. Afr.

(*b*) See map No. 5 ; widely distributed south of 12° 10′ N.

(*c*) Ibadan: only 28 adults seen, 5 between 16 Feb. and 12 Mar. and the remainder between 15 May and 14 Dec. most numerous in mid-May–June and in Sept.–mid-Oct. Other localities: recorded in every month except March.

(*d*) *H. thoracica* is found most often on grass-bordered paths and farmland. Although this species is as common as *H. couloniana* at Ibadan no bionomical data have been obtained; from the adult incidence it seems probable that there are two generations during the rains. A last instar nymph of this species was collected at Bauchi on 5 June, 1936; adults were numerous at Karim on 16 Sept., 1941, and Gascoigne found adults attacking Bulrush Millet at Nahuce on 15 Sept., 1944.

(68) *Humbe tenuicornis* Schaum.

(*a*) Fr. Sud., A.E. Sud., B.C., Ug., Ken., T.T., S. Rhod., S. Afr.

(*b*) Widely distributed south of 12° N.

(*c*) Ibadan: throughout the year, most numerous in May–June and Aug.–Sept., very rare from Nov. to Mar.

(*d*) This species occurs in *Cynodon* and other short grass habitats and on grass-bordered paths at Ibadan. Nymphs have been found in Feb.–May and in Sept.–Oct.; teneral adults on 3, 12 Apr. and 10, 20 June; adults bred on 25 Feb., 9, 23 Aug. and 11, 19, 21 Sept.; gravid females found on 10 May, 17, 31 Aug., 9, 13, 29 Sept., 4 Oct. and 9 Dec. There are probably two generations in the year. In Dec. last instar hoppers were collected at Oyo and Afikpo and a teneral adult was found at Zaria.

Four adults with the sides of the thorax and the hind femora of a yellow-green colour were taken at Ibadan on 19, 21 June and 20 July and at Ilorin on 13 July.

At light.—Ibadan, 21, 22 Apr., 16 June, 17 Nov., 6 Dec.

(69) *Oedaleus nigeriensis* Uvarov.

(*a*) Fr. Sen., Fr. Sud., G.C., Fr. Nig., A.E. Sud., Ug., Ken.

(*b*) Widely distributed, but very rare in the "true forest zone."

(*c*) Ibadan: throughout the year, common in late Apr., late June–mid-July, Aug.–Sept. and late Dec. Chad: 23 May and 12 July to 24 Oct.

(*d*) This species frequents *Cynodon* and other short grass habitats, paths and farmland. At Ibadan, hoppers have been taken in Feb., Mar., June and Sept.–Nov.: teneral adults on 10, 20, 26 Mar., 12 Apr., 25 May, 10, 28 June, 19 Sept. and 5 Nov.; 18 adults were bred out between 24 July and 6 Sept.; *coitus* was observed on 12 May, 30 June and 14 Dec.; gravid females were found on 3 Jan., 15, 17, 25 Aug., 13, 30 Sept., 6 Oct. and 9, 20 Dec. It seems probable that there are three generations in the year.

This species is uncommon in the Chad area; Gwynn found only 13 adults, one of which had recently moulted (17 Sept.); the writer took one at light on 23 May. It is abundant at Zaria and Kano in June and July. In July, 1944, bands of hoppers were present at Daura and in the Tessawa district (Fr. Nig), some 50 miles to the north-west. It seems probable that there is an embryonic diapause during the dry season in the northern part of this species' range, and that there is only one generation *per annum*.

At light.—Fr. Nig.—Tessawa, 22, 24 July; Niamey, 7 Aug. (recorded by Guichard).

(70) *Oedaleus senegalensis* Krauss.

(*a*) Fr. Sen., Fr. Sud., Fr. Tch., A.E. Sud., Ken., T.T., S. and W. Asia.

(*b*) Gadau, Sherifuri, Maiduguri, Chad (Baga Seyoram to Kalkala).

(*c*) Kalkala: 23 May to 24 Oct.; common between mid-Aug. and mid-Oct. in the Chad area.

Map No. 6.—Distribution of *Gastrimargus africanus* Sauss.

(*d*) This species is most often found in farmland, but occurs everywhere in the inland habitats: the writer found adults attacking cotton at Gusko in Oct., 1931. Gwynn found nymphs to be abundant on 28 Aug. and 15 Sept. There is probably an embryonic diapause and only one generation in the year.

At light.—Kalkala, 23 (4), 25 (3) May, 18 (5) June; Maiduguri 17–20 (several each night), 21 (many) May.

(71) *Gastrimargus africanus* Saussure.

(*a*) Fr. Sud., S.L., G.C., Fr. Nig., A.E. Sud., B.C., Ug., Ken., T.T., S. Rhod., S. Afr.

(*b*) See map No. 6: widely distributed, but uncommon in the "true forest zone."

(*c*) Ibadan: 27 Sept. to 23 May, abundant from mid-Oct. to mid-Nov. Kalkala: late June to 15 Oct., most numerous from mid-July to mid-Aug.

(*d*) At Ibadan, *G. africanus* occurs in *Cynodon*, other short grasses, and on paths and bare farmland. Hoppers have never been found, but teneral adults were collected on 25, 28 (2) and 30 Oct., 1946, and it is evident that the sudden appearance of adults in Oct. is due to a generation of hoppers becoming mature and not to migration, as the writer had thought for many years. Copulation was observed on 17 Nov. The diminution in numbers after mid-November is possibly partly an aftermath of breeding, but it is largely due to the activities of a flock of about 60 Cattle Egrets, which arrives on Moor Plantation in early Nov. each year, and spends its days grasshopper-hunting in the *Cynodon* habitat. A Black Drongo was seen to capture an adult at Ibadan on 1 Nov., 1946.

At Kalkala in 1933 the writer saw 7 adults in June (none was observed between Jan. and May); Gwynn arrived there on 5 Sept., and took only one adult (on 20 Sept.) between that date and the following January. In 1934 he found many adults between 12 June and 15 Oct., five of which were teneral (4 in early Aug. and 1 on 15 Oct.), and also collected about 43 nymphs between 19 July and 17 Sept. He describes the hoppers as being geophilous and very sluggish. It is evident that there is an embryonic diapause during the dry season in the north (from about Oct. to Apr.); the meagre evidence available suggests that there is also a diapause at Ibadan, which ends in about Aug. Gwynn describes *G. africanus* as a characteristic species of the inland habitats of Chad, and suspects that migration to the lacustrine area may take place. In 1933 the writer took this species at light in Maiduguri on 21 May, about a month before it appeared in the Kalkala area.

Analysis of the adult incidence of *G. africanus* in the remaining localities gives the following results:

(i) Present between 4 June and 21 Oct.: Sokoto, Kano, Gadau, Zaria, Karim, Okene, Bida and Meko.

(ii) Present between 15 Oct. and 7 May: Enugu, Nkwele, Owena, Oyo and Ilorin.

(iii) Intermediate: Yandev (44 between 17 Oct. and 5 Nov., but 1 taken on 21 Aug.); Plateau Province (3, 9 Apr. and 23 June).

(iv) Indeterminate: Although only 2 adults have been seen in May at Ibadan in the last 15 years, Wilson took 10 at Ijebu-Ode between 4 and 9 May, 1946, and the writer collected 6 at Olokemeji on 22 May, 1946. It is possible that the autumn-bred adults survive longer in forest conditions than they do on the open *Cynodon* on Moor Plantation.

At light.—Ibadan, 3, 17 Jan., 23 Feb., 8, 28 Apr., 28 Oct., 5, 10 Nov., 13 Dec.; Ilorin, 3 Nov.; Maiduguri, 21 May; Niamey (Fr. Nig.), 7 Aug.

(72) *Gastrimargus nigericus* Uvarov.

(*a*) S.L., G.C., Fr. Tch.

(*b*) Igbogun, Abraka, Ibadan, Zaria, Sokoto, Bauchi, Gadau, Sherifuri, Kalkala; widely distributed, but rare (especially in the south).

(*c*) Kalkala: Gwynn took 8 adults between 15 June and 25 July. Only 9 other specimens have been collected, 6 from northern localities on 16, 17, 22

June and 2, 11, 30 July, and 3 from southern stations on 4 Nov. and 12, 29 Dec.

(*d*) Four of the Kalkala adults were in inland *Cymbopogon*. The fact that all the 14 northern specimens were taken between 15 June and 30 July suggests that there is a very long embryonic diapause in that area. The only specimen seen at Ibadan in 16 years' collecting was a teneral adult captured on 29 Dec., 1946 ; it is probable that, like *G. africanus*, the hoppers become adult towards the end of the rainy season.

(73) *Gastrimargus* sp.

Bumpus collected 2 adults at Bamenda in May, 1946.

(74) *Locusta migratoria migratorioides* Reiche & Fairmaire.

The solitary phase of *Locusta* is a permanent resident of the littoral area of Chad and of the Mongonu and Marte districts and north-eastern Dikwa Division. The black-cotton soil areas between Marte and Dikwa and to the north-east and east of Dikwa are of special importance, and bands of *congregans* hoppers were present there in 1942, 1945 and 1946.

(75) *Trilophidia conturbata* Walker.

(*a*) Fr. Sud., S.L., Fr. Tch., Ug., S. Afr.

(*b*) Widely distributed, but not common except at Kalkala.

(*c*) Ibadan : only 33 adults ; taken in every month except Mar. and Aug. ; most numerous in May–June and Sept.–Oct.

(*d*) Found on paths and bare farmland. At Ibadan, teneral adults were caught on 11 (2) May and 3 June ; an adult was bred out on 12 Oct. and a gravid female was taken on 29 Sept. Chesler (4), who has described the nymphal instars of this species, records that there are two generations a year in South Africa ; the data available suggest that there are also two generations a year at Ibadan, one becoming adult in May–June and the other in Sept.–Oct. At Kalkala the writer found *T. conturbata* to be common in Jan. and again in June, 1933. Gwynn took 13 adults between 5 July and 9 Aug., 1934, and one adult on 23 Nov., 1933. He collected two nymphs on 9 Aug. The writer found the Asilid fly, *Philodicus turinus* Walk., feeding on a recently-moulted adult at Zaria on 7 July, 1941.

At light.—Kalkala, 27 Mar., 23 May ; Maiduguri—21 May.

(76) *Trilophidia repleta* Walker.

(*a*) Fr. Sud.

(*b*) Kano, Sokoto, Kalkala ; all north of 12° N.

(*c*) Only six adults have been taken, two at Sokoto on 17 June, two at Kano on 30 Sept. and 1 Oct., 1937, and two at Kalkala ; one of these was caught by Gwynn on 23 Nov., 1933, and the other by the writer on an unknown date in the first half of that year.

(77) *Trilophidia* sp.

Gwynn caught one female of this large species at Kalkala on 19 July, 1934.

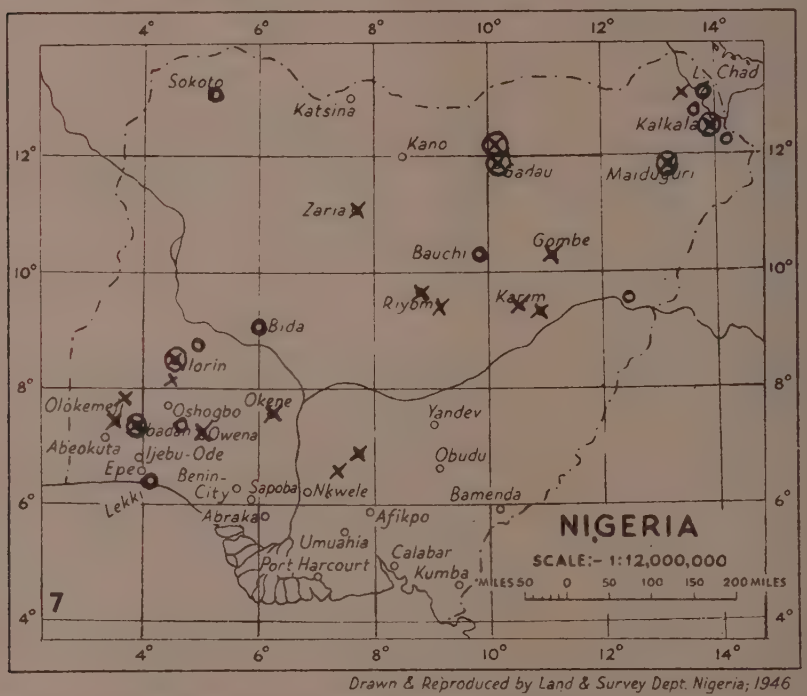
(78) *Acrotylus blondeli* Saussure.

(*a*) Fr. Sen., Fr. Sud., G.C., Fr. Tch., A.E. Sud., Ug., T.T.

(*b*) See map No. 7; widely distributed, but very rare in the "true forest zone."

(*c*) Kalkala: throughout the year, most numerous in late Sept.

(*d*) The favourite habitats of this species at Kalkala were *Pulicaria*, *Peristrophe* and farmland. Fourteen nymphs were found between 21 June and 27 Sept.; they were most numerous in mid-August. An adult was bred on



Drawn & Reproduced by Land & Survey Dept. Nigeria; 1946

Map No. 7.—Distribution of × *Acrotylus patruelis* H. Sch. and ○ *A. blondeli* Sauss.

28 June and two gravid females were captured on 22 June. It seems probable that there are two generations during the rains in the Chad area.

A. blondeli frequents paths at Ibadan. Only 11 adults have been taken on 28 Feb., 5 (2) Mar., 7 (3), 18, 19 (3) Apr. and 1 June; the Feb. adult was teneral. Adults were fairly common on sandbanks in the river Aza at Ilorin in Apr., 1942, and several were present on the sand ridge at Lekki (which separates the sea from the Lekki Lagoon) in Dec., 1937. Two medium-sized nymphs were caught on the Lekki sand ridge on 11 and 13 Dec., and the meagre data available suggest that, in the southern localities, there is an embryonic diapause during the rains which ends in about Nov.

At light.—Kalkala, 23 (3) May; Maiduguri, 21(many) May.

(*e*) Uvarov (13) mentions two specimens, one from Sherifuri and the other from the Gold Coast, in which the base of the wing was rosy and has named them ab. *rosescens*. The wings of all the adults seen by the writer have the normal bluish coloration.

(79) *Acrotylus insubricus* Scopoli.

(*a*) Morocco (Atlas), N. Afr., Egypt, S. Europe, W. Asia.

(*b*) The writer took two adults at Kalkala, one in early Jan., 1933, and the other at light on 25 May, 1933.

(80) *Acrotylus patruelis* H. Sch.

(*a*) Fr. Sud., A.E. Sud., B.C., Ug., Ken., T.T., Nyasa, N. Rhod., S. Rhod., S. Afr., Egypt, S. Europe, W. Asia.

(*b*) See map No. 7 ; widely distributed, but very rare in the "true forest zone."

(*c*) Kalkala : 23 May to 26 Sept., most numerous in mid-Aug.

(*d*) At Kalkala Gwynn found nymphs on 19 (3) Aug. and 17 Sept., also a teneral adult on 19 July. This rather rare species frequents farmland in Chad.

At Ibadan only 3 adults have been collected, on 11 Mar., 12 May and 7 June ; the last two were in *Cynodon*. Except at Balah, where adults were fairly common on 2 Nov., 1937, only one or two specimens have been taken at each of the remaining localities.

At light.—Ibadan, 11 Mar. ; Kalkala, 23, 28 May, 18 (2), 25 June ; Maiduguri, 21 (2) May.

(81) *Sphingonotus* sp.

Wilson caught one adult at Gombe in late May, 1942.

(82) *Eurysternacris brevipes* Chopard.

The writer captured one specimen at Kingowa (Chad) on 17 Oct., 1931.

(83) *Pternoscirtus gracilis* Miller.

(*a*) Ken., T.T., S. Rhod.

(*b*) Olokemeji, only two adults on 23 Mar. and 26 Nov. Four adults taken at Ilorin in Dec., 1936, possibly belong to this species.

Pyrgomorphinae.

(84) *Tenuitarsus* sp.

One female was taken by the writer at Kalkala on 10 June, 1933. This may be the species found to be common in Kordofan (A.E. Sud.) by Maxwell-Darling (10).

(85) *Chrotogonus senegalensis* Krauss.

(*a*) Fr. Sud.

(*b*) Sherifuri, Kalkala. Gwynn caught four adults in the rest house compound at Kalkala on 27 Sept., 1933.

(86) *Chrotogonus* spp. 1 and 2.

Two species, one macropterous and the other brachypterous, occur at Kalkala in addition to the brachypterous *C. senegalensis*. The writer found adults and nymphs in every month from Jan. to June, 1933; both were numerous in *Peristrophe* in Jan. and in Bulrush Millet fields in late June. Gwynn saw 22 adults, mostly of the brachypterous species, between 5 July and 15 Sept., 1934; he records that *Chrotogonus* spp. were very numerous in the rest house compound on 27 Sept., 1933.

(87) *Chrotogonus* spp. 3 and 4.

Macropterous and brachypterous species are also present in the south and other localities in the north. Owing to taxonomic difficulties it is uncertain how many species are represented, and it is proposed to deal only with a brachypterous species which occurs at Ibadan. Adults have been seen in every month from Jan. to Sept. and on 9, 28 Nov.; they are usually on roads or flower beds in gardens or in *Cynodon*. Nymphs have been found on 3 Jan., 7 Apr. and 30 July; an adult was bred on 25 Sept.; *coitus* was observed on 10 Mar., 7 May, 7, 19 June and 1 July. The 10 hoppers seen on 7 Apr. had hatched recently. Total length, ♂ 14, ♀ 20; hind femur, ♂ 7, ♀ 9·5 mm.

One species of *Chrotogonus* attacks Tobacco leaves at Zaria; the Ibadan species has been seen eating Zinnia leaves.

(88) *Tapesia oberthüri* Bolivar.

(*a*) S.L.; data incomplete.

(*b*) Wilson took one adult at Barakin Ladi on 7 Apr., 1946.

(89) *Maura lurida* F.

(*b*) Olokemeji, Ibadan, Dumagi.

(*c*) One adult in each locality on 25 Mar., 19 Mar. and 10 July respectively.

(*d*) All three were taken in thick bush. A light-coloured variety of *M. lurida* is not uncommon at Zaria; five adults were taken between late May and 4 Aug., and one last instar nymph on 23 July.

(90) *Taphronota amaranthina* Bolivar.

(*a*) Togo.

(*b*) Ibadan.

(*c*) Eleven females were caught between 28 June and 20 Sept., most numerous in early July.

(*d*) In June, 1939, nymphs were found feeding on *Anthocleista* and *Rauwolfia*; teneral female on 2 July; male bred out on 4 July. It seems probable that there is an embryonic diapause from about Oct. to Apr. This species is phytophilous and occurs in thick bush; all the adults were taken on *A. nobilis* on which they were seen to feed.

(91) *Taphronota calliparea* Schaum.

(*a*) Gab., Ug., S. Rhod.; data incomplete.

(*b*) Bamenda.

(*c*) Bumpus caught six adults, three in May and three in July, 1946; Walker took one adult in Apr., 1942.

(92) *Taphronota ferruginea* Fabricius.

(*a*) S.L., G.C., B.C., Ug.

(*b*) Igbogun, Epe, Benin, Owena, Ibadan, Sapoba, Umuahia, Nkwele; all in or bordering the Forest Zone.

(*c*) Ibadan: 18 adults between 6 May and 29 Sept.; most abundant from mid-June to late July. Other localities: 12 adults between 7 May and 12 Sept., also one on 8 Nov. (Igbogun) and one on 16 Jan. (Epe).

(*d*) At Ibadan, three last instar nymphs were taken on 26 Apr., 18 June and 30 July; there is probably an embryonic diapause from about Oct. to Mar. It is curious that the only two adults (out of 32) found after Sept. should have been in localities bordering the Lekki Lagoon. Both adults and nymphs feed on *Anthocleista* at Ibadan; they are phytophilous and occur in thick bush.

At light.—Owena, 16 June.

(93) *Taphronota occidentalis* Karsch.

(*a*) Togo.

(*b*) Roebuck collected one adult at Kumba on 12 Sept., 1936.

(94) *Rutidoderes squarrosus* L.

(*a*) S.L., B.C., Ken.

(*b*) Owena, Umuahia, Ibadan.

(*c*) Ibadan: only 8 adults, between 27 Apr. and 25 June. Other localities: 4 adults between 15 May and 2 June.

(*d*) A phytophilous species found only in thick bush at Ibadan; hoppers have not been seen. There is probably a long embryonic diapause. On 12 June, 1939, a male was found on a female, but they were not *in coitu*. On being handled these grasshoppers raise their elytra to expose the scarlet-coloured wings. Autohaemorrhage also occurs; the exudation is foamlike.

At light.—Owena, 1 June.

(95) *Phymatevs karschi* Bolivar.

(*a*) P.E. Afr.

(*b*) Gindi Akwati, Jos, Zaria, Gusau, Kano; these localities lie in a rectangle bounded by Long. 6° 30′ and 9° E., and by Lat. 12° and 9° 30′ N.

(*c*) All localities: 23 Sept. to 4 Feb., 13 Mar., 6, 15 July.

(*d*) This large phytophilous species occurs principally on *Thevetia* hedges, but in Oct., 1946, it was reported to be attacking all hedges (principally *Thevetia*) and many trees at Kano. It has also been recorded as damaging various garden plants and Potato in the plateau. Small bands of young hoppers were present at Gindi Akwati on 29 May, 1944, and at Gusau on 14 June, 1944. Large nymphs have been seen at Kano in Aug. and Sept.; the first adults appear between mid-Sept. and mid-Oct. Comatose adults were numerous at Jos in late Jan., 1943; the writer noticed that they became more active on warmer days when the "harmattan" was not blowing, but

none was seen to feed. He found a comatose adult at Zaria on 13 Mar., 1939, which adopted a warning posture with raised wings when disturbed, and also two moribund adults in the same locality on 6 and 15 July, 1941. It seems probable that oviposition occurs after the beginning of the rains in early May.

In Sept., 1944, Gascoigne collected a number of large hoppers at Kano; he kept half of them for breeding in a cage there and sent the remainder alive to the writer at Ibadan. The first adult emerged on 23 Sept. at Kano and on 7 Nov. at Ibadan.

Map No. 8.—Distribution of *Zonocerus variegatus* L.

(96) *Phymateus viridipes* St.

(*a*) G.C., A.E. Sud., B.C., Ug., Ken., T.T., N. Rhod., S. Rhod., S. Afr.

(*b*) Olokemeji, only three adults, two on 4 May, 1936, and one on 7 Mar., 1944.

(97) *Zonocerus variegatus* L.

(*a*) Fr. Sen., Gamb., Fr. Guin., Fr. Sud., S.L., G.C., Fr. Tch., B.C., Ug., Ken.

(*b*) See map No. 8; widely distributed in the south; near rivers and streams or in marshes in many localities in the north.

(*c*) Ibadan: every month from mid-Jan. to June; occasional adults also seen from July to Dec. (see below). Chad.: 19 Aug. to 10 Oct.

(*d*) The writer (6) has described the results of some breeding experiments in cages at Ibadan. The shortest period between eclosion and final ecdysis averaged 104 days over a four-year period. In the field at Ibadan hatching occurs between mid-September and mid-October as a rule; the first adults are seen between mid-January and the end of February. The writer found that sexual maturation is correlated with the increase in atmospheric humidity at the onset of the rains; oviposition takes place in Apr. The writer believes that the increase in soil temperature in the autumn (due to increased air temperatures and the slackening of the rains) is the factor inducing eclosion. He took soil temperatures at a depth of 3 in. at 1.30 p.m. throughout 1940 and 1941, and found that the temperature gradually rises from about 81° Fahr. in mid-Sept. to about 87° Fahr. in late Oct. and 89·5° Fahr. in mid-Nov.

At Ibadan a small number of hoppers hatch between Feb. and Apr. and they become adult between June and Sept. In the north hatching takes place between Feb. and Apr. and adults appear in July–Aug. There is an embryonic diapause during the dry season. In the Ilorin Province hatching usually occurs in the spring, but the writer saw a small band of first instar hoppers at Esiye, in thick bush near a river, on 6 Nov. 1937.

Z. variegatus is phytophilous and polyphagous; the nymphs often cause considerable damage to Cotton in Oct.–Dec., and the adults attack Sweet Cassava and many other crops and garden plants. The hoppers occur in bands, and on occasion were seen to be migrating steadily eastwards across a Cotton field on Moor Plantation. This species was abundant at Ibadan in the dry season of 1944–45, but only 20 nymphs were found in the following year—an unprecedented event in the writer's 25 years' experience of Moor Plantation. The rainfall in Sept. and Oct., 1945, was 8·10 in. and 12·55 in. as compared with means of 6·99 in. and 6·11 in. (over 40 years); the October rainfall of 1945 was the highest figure for that month since recording began in 1905. It is probable that the excessive precipitation was responsible for the very small hatch; *Z. variegatus* was also rare at Ibadan in the 1946–47 dry season.

(98) *Poekilocerus hieroglyphicus* Klug.

(*a*) Fr. Sud., Fr. Nig., A.E. Sud., Som., Egypt.

(*b*) Sherifuri, N'Guru, Maiduguri, Chad (Kauwa, Kalkala); all north of 12° N.

(*c*) Kalkala, 20 Apr.–July.

(*d*) This species is phytophilous and occurs most frequently on *Calotropis*, on which it feeds. Copulation took place in early June and oviposition was first seen on 21 June. Small hoppers were observed at Kauwa on 8 Oct., 1931, so eclosion probably takes place in about Aug.; the adults die soon after mating and the nymphs spend the dry season in a comatose state, sometimes beneath low-growing plants. In early March nymphs became more abundant at Kalkala (presumably owing to their emergence from hiding-places) and more active; the first adult was seen on 20 Apr., and final ecdysis was observed on many occasions during the next fortnight. There is evidently only one gene-

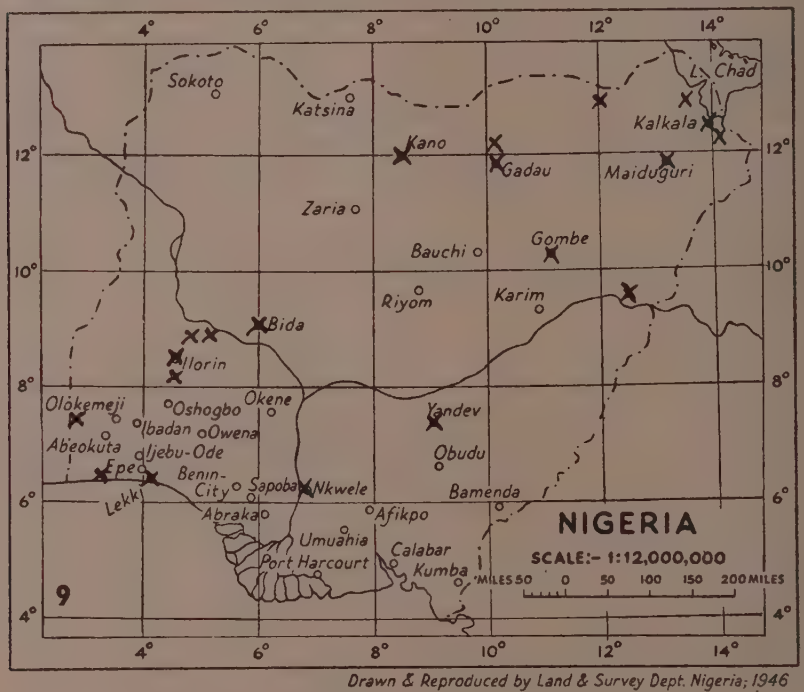
ration a year. On 19 July, 1934, Gwynn found a female *P. hieroglyphicus in coitu* with a male *Locusta* at Kalkala!

(99) *Pyrgomorpha cognata* Krauss.

(*a*) Fr. Sen., Fr. Sud., G.C., Fr. Tch., A.E. Sud., Ken., Algerian Sahara, Egypt.

(*b*) See map No. 9; widely distributed, but not present in the Forest Zone.

(*c*) Kalkala: throughout the year, most numerous in Feb.–Apr. and Aug.–Sept.



Map No. 9.—Distribution of *Pyrgomorpha cognata* Kr.

(*d*) *P. cognata* was commonest in the dried habitats at Kalkala, such as *Cymbopogon*, *Peristrophe* and *Chloris*. Nymphs were seen in every month from Dec. to Aug., they were most abundant in early Apr. and Aug.; there are probably two generations a year. Oviposition was observed on 27 Feb., 1933. This species has been seen feeding on *Pulicaria* and *Ricinus*. Its distribution is comparable to that of *Mesopsis gracilicornis* and *Stenohippus xanthus*; it extends down the strip of Guinea Savannah west of Abeokuta and is present in the Coastal Belt, although absent from the Forest Zone to the east of Abeokuta.

At light.—Kalkala, 15, 18, 19, 25 Jan., 18, 25 (2) Feb., 13 (2), 23 (3) May; Maiduguri, 18, 19, 21 May.

(100) *Pyrgomorpha kraussi* Uvarov.

(*a*) Gamb., Fr. Sud., S.L., G.C., A.E. Sud.

(*b*) See map No. 10 ; widely distributed outside the Forest Zone ; but not found in the western strip of Guinea Savannah or in the Coastal Belt.

(*c*) Kalkala : throughout the year, most numerous in Jan.–Feb. and June–Aug.

(*d*) *P. kraussi* occurred most often in *Peristrophe*, *Urochloa* and old farmland at Kalkala. Nymphs were found in Jan.–June and Aug.–Oct. ; they were

Map No. 10.—Distribution of *Pyrgomorpha kraussi* Uv.

numerous in Mar., May and early Aug. There are probably two generations a year. Oviposition was seen on 13 Mar., copulation on 26 June, and gravid females on 11 Mar. and 26 June.

This species is fairly common at Zaria and in the Ilorin Province ; it has been recorded as a pest of Potato and Tobacco at Zaria and of Turnips at Ilorin.

At light.—Kalkala, 28 Jan.

(101) *Atractomorpha aurivillii* I. Bolivar.

(*a*) S.L., B.C., Ug., Ken., S. Afr.

(*b*) Widely distributed, but rare in the north.

(*c*) Ibadan : throughout the year.

(*d*) At Ibadan this species has seldom been found away from the river Awna (where it feeds on *Jussieua*) or the various small tributaries of that river. Nymphs have been found in every month except Jan., May and Nov.; they were numerous on 18 Feb. and 4 Apr. Two teneral adults were found on 4 Apr. There appear to be about three generations a year. An adult was found attacking *Torenia* in a garden on 13 June, 1939.

This species was not seen at Kalkala in 1933; Gwynn took one adult at light on 10 Sept., 1934, and saw 10 adults and 5 nymphs, all last instar, in *Brachiaria* on 24 and 25 Sept.

(102) *Atractomorpha gerstaeckeri* I. Bolivar.

(*a*) S.L., A.E. Sud., B.C., Ug., Ken., T.T., S. Afr.

(*b*) Found only in the Climatic Forest Zone.

(*c*) Ibadan: only 25 adults seen, between 13 Aug. and 1 May, most numerous in Sept. Other localities: 5 July, Aug., Dec., Jan., Mar., and Apr.

(*d*) This species is usually found near the river Awna or its tributaries at Ibadan. One nymph and a teneral adult were found on 5 Sept.; an adult was bred on 8 Feb. from a nymph found on *Amaranthus* on 13 Jan. One hopper was taken at Owena on 16 Aug., and many were seen on 19 Dec.: one nymph was collected at Kumba in Mar.

At light.—Ibadan, 5 Dec.

Catantopinae.

(103) *Pterotiltus versicolor* Ramme.

Bumpus caught six adults of this brightly-coloured, brachypterous species at Bamenda in May, 1946.

(104) *Oxya hyla* Serville.

(*a*) Fr. Sud., S.L., A.E. Sud., Ug., Ken., S. Rhod., S. Afr., Madagascar.

(*b*) Chad (Metele to Mafindere).

(*c*) Kalkala: 13 Mar. to Aug., Oct., Dec.; undoubtedly present throughout the year; habitats inaccessible in Jan.–Feb.

(*d*) An hygrophilous species which frequents *Brachiaria*, *Cyperus* mixed with *Cynodon*, *Echinochloa* and *Vossia*; hind tibiae adapted for swimming. Nymphs were found in Apr., July, Aug. and Oct.; they were abundant in late July.

At light.—Kalkala, 23 (5) May, 18 (3), 26 June.

(105) *Oxya hyla minor* Sjöstedt.

(*b*) See map No. 11; this small subspecies is widely distributed in the south outside the "true forest zone" and has twice been taken at Sokoto. Gwynn mentions a seasonal variation in size in *O. hyla* at Kalkala.

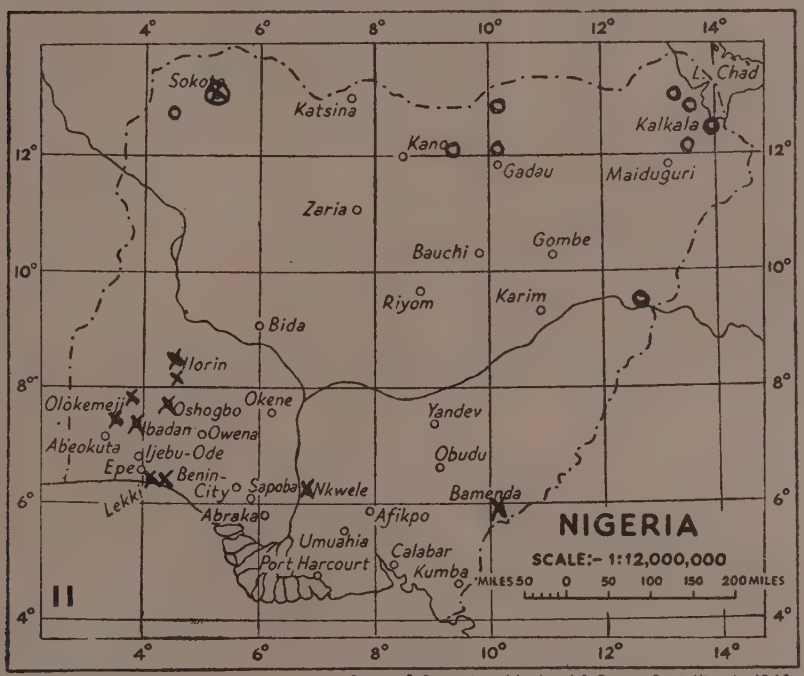
(*c*) Ibadan: throughout the year.

(*d*) Uvarov (14) says: "Apparently all species of *Oxya* are confined in their habitat to marshy places." This is not true of *O. h. minor*, which occurs commonly on tall grass away from water at Ibadan and elsewhere in the south, although in the dry season it is usually found on grass near streams. Last instar nymphs were found on 25 June, 16, 28 July and 14 Dec.; a teneral

adult on 10 Oct.; a gravid female on 15 Sept.; an adult was bred on 6 Sept., and *coitus* was observed on 28 Jan., 2 Feb., 24 Mar., 25 (2), 30 Apr., 8 May, 24 June, 10 Nov. and 25 Dec. It seems probable that there are at least two generations a year. This phytophilous Acridid is usually found on *Panicum*, *Pennisetum purpureum* and *Paspalum scrobiculatum*; it has been seen to feed on all these tall grasses and also on Rice, Maize and Cannas.

(106) *Oxya cyanipes* Karny.

The writer took one adult at Ilorin on 12 Dec., 1936.



Drawn & Reproduced by Land & Survey Dept. Nigeria; 1946.

Map No. 11.—Distribution of × *Oxya hyla minor* Sjöst. and ○ *Hieroglyphus daganensis* Kr.

(107) *Hieroglyphus africanus* Uvarov.

(*a*) Fr. Sud., G.C., Fr. Cam., A.E. Sud., Ug.

(*b*) Karim, Mutum Daya, Sherifuri.

(*c*) About 6 adults were collected in tall grass near a small stream at Karim in late Sept., 1941, and one specimen was taken at Mutum Daya at the same time; Lloyd caught one male at Sherifuri. The males are macropterous and the females brachypterous.

(108) *Hieroglyphus daganensis* Krauss.

(*a*) Fr. Sen., Fr. Sud., Fr. Tch., A.E. Sud.

(*b*) See map No. 11; a common species in marshes north of 12° N., and also in the Benue marshes near Yola.

(*c*) Kalkala : Gwynn saw adults between 21 Aug. and 22 Nov. ; they were most numerous in Oct. The writer found two adults in early Jan. and five on 24 Feb., 18, 19 (3) Apr. ; all were very worn, and had obviously been in the imaginal instar for some months.

(*d*) Gwynn collected a nymph on 22 Sept. ; the writer saw a pair *in coitu* at Kukawa on 7 Oct. and many copulating pairs at Dongo on 14 Nov. Large hoppers were found at Sokoto and Nahuce in Sept. It is evident that there is an embryonic diapause from Oct. or Nov. to about July. The principal habitats of this species at Kalkala are *Brachiaria* and *Echinochloa*, whilst Gwynn found many adults in *Andropogon* and *Sorghum aethiopicum* in the Dikwa Division. There are macropterous and brachypterous forms of both sexes, the latter is more numerous at Kalkala. All the 82 adults received from Yola were brachypterous. Gascoigne found adults and large nymphs attacking Bulrush Millet at Nahuce in Sept., 1944.

At light.—Mongonu 28 (several) Sept. ; Kalkala, 11 (several) Sept. ; Sokoto, 22, 23, 24 Oct.

(109) *Spathosternum nigrotaeniatum* St.

(*a*) Fr. Sen., Fr. Sud., B.C., S.W. Afr., India, Siam.

(*b*) Kalkala.

(*c*) Gwynn took about 30 adults between 2 July and 5 Dec. ; the writer found 3 in early Jan. ; most numerous in Sept.

(*d*) This species occurs in the *Brachiaria*, *Cynodon* and *Chloris* habitats. Gwynn found a hopper on 4 June. There is probably an embryonic diapause during the dry season.

(110) *Spathosternum pygmaeum* Karsch.

(*a*) Fr. Sud., S.L., I.C., G.C., Togo., B.C., Ug., Ken., T.T., S. Rhod.

(*b*) Widely distributed in the Climatic Forest Zone, also found in marshes at Gidan Usumanu and Ingawa in the north.

(*c*) Ibadan : throughout the year, common from May to Oct.

(*d*) At Ibadan *S. pygmaeum* occurs in *Cynodon* and other short grasses and also on young leaves of taller grasses, such as *Panicum*. It has been seen feeding on Maize and *Pennisetum purpureum*. Six large nymphs were taken on 19 Sept., and hoppers were abundant on 4 Oct. ; adults were bred on 25, 27 May, 1, 12 June, 3 July, 1 Aug. and 12 Oct. ; teneral adults on 15, 21, 22 Apr. and 6 June (the last at Oshogbo) ; gravid female on 13 Sept. ; *coitus* observed on 15 Mar., 3, 12 June and 15, 24 Oct. There are two generations during the rains.

At light.—Ibadan, 29 Aug.

(111) *Tristria conops* St.

(*a*) Togo ; data incomplete.

(*b*) Wilson caught an adult at Barakin Ladi on 6 Apr., 1946.

(112) *Tristria pallida* Karny.

(*a*) A.E. Sud., Ug.

(*b*) Zaria, Bauchi, Chad (Abeli Ashettammari to Wulgo).

(*c*) Kalkala : throughout the year, rare from mid-July to mid-Sept.

(*d*) Found principally in *Chloris*, *Cynodon* and *Brachiaria* at Kalkala ; also common in *Hyparrhenia* and *Sporobolus* sp. elsewhere in Chad. Gwynn collected hoppers between 7 Aug. and 4 Dec. ; they were abundant between mid-Sept. and mid-Oct. ; he found a teneral adult on 25 Sept., and saw a pair *in coitu* on 12 July. The writer took two gravid females on 26 June. *T. pallida* passes the dry season in the adult stage, the females oviposit in July and adults of the new generation begin to appear in late Sept. Only three specimens have been taken outside the Chad area. There are a number of colour forms.

(113) *Tristria sudanensis* Karny.

(*a*) Fr. Sud., A.E. Sud., T.T.

(*b*) Lloyd took 4 adults at Sherifuri.

(114) *Afroxyrrhepes obscuripes* Uvarov.

(*a*) Togo, B.C., A.E. Sud., Ug., T.T.

(*b*) The writer caught an adult at Ibadan on 11 Apr., 1946 ; Uvarov (17) mentions another specimen from an unknown locality in Nigeria and two from the Cameroons.

(115) *Chloroxyrrhepes virescens* St.

(*a*) Fr. Sen., Fr. Sud., S.L., Togo.

(*b*) The writer took one specimen, probably at Ibadan.

(116) *Homoxyrrhepes punctipennis* Walker.

(*a*) Fr. Sud., S.L., G.C., B.C., Angola, T.T.

(*b*) Widely distributed outside the "true forest zone," but not very abundant.

(*c*) Kalkala : Gwynn found 33 adults between 27 Aug. and 21 Oct. ; they were most numerous in the second half of Sept.

(*d*) At Kalkala, Gwynn took 8 hoppers on 18 July and one on 25 July ; there is evidently a very long embryonic diapause in the Chad area.

At Ibadan the writer has taken only 4 adults on 13 June, 31 July, 16 Aug. and 1 Oct. A nymph caught at Olokemeji on 22 May became adult (at Ibadan) on 13 June, another caught at Oshogbo on 7 June became adult (at Ibadan) on 25 July. An adult was seen at Oyo on 10 Feb., 1942.

At light.—Ibadan, 13 June ; Kalkala, 27, 30 Aug.

(117) *Tropidopola* sp., probably *nigerica* Uvarov.

(*a*) Fr. Sud.

(*b*) Kalkala : four adults, three taken by Gwynn and the writer at light on 23 May, 13 June and 13 July, one collected by Iwenjora on 16 Feb. Gwynn says that "the Chad specimens agree with those taken by Lean in French Sudan," which are *nigerica* (20).

(118) *Sudanacris pallida* Burmeister.

(*a*) Fr. Sud., Fr. Tch., A.E. Sud.

(*b*) Chad (Baga Seyoram to Wulgo).

(*c*) Kalkala : throughout the year, rare from mid-July to mid-Sept.

(*d*) The writer found gravid females on 13, 26 June, and Gwynn saw hoppers from 25 July to 25 Oct. ; they were most numerous in Sept. Oviposition probably occurs in early July, and the first adults of the new generation appear soon after mid-Sept. ; they survive the dry season and breed in June. This phytophilous species is found most often in *Chloris*, *Brachiaria* and *Hyparrhenia* ; the adults are rather inactive and spend most of the day resting on grass shoots, which they resemble closely both in shape and coloration. The crop of a Northern Black-bellied Bustard (*Lissotis melanogaster*) shot by the writer on 14 Feb., 1933, contained the remains of 29 adults of *S. pallida*.

(119) *Rhamphacrida kraussi* Bolivar.

(*a*) Togo., A.E. Sud., B.C., Angola, T.T., S. Rhod.

(*b*) The writer took one adult in short grass at Zaria on 13 Mar., 1939.

(120) *Leptacris monteiroi* Bolivar.

(*a*) Togo., B.C., Angola, Ken., T.T., Nyasa, S. Rhod.

(*b*) Lloyd caught one male at Sherifuri.

(121) *Leptacris violacea* Karny.

(*a*) Fr. Sud., A.E. Sud., B.C., Ug.

(*b*) Bida, Kalkala.

(*c*) Gwynn caught two adults in *Hyparrhenia* at Kalkala on 22 Oct., 1934 ; one was taken at Bida on 4 June, 1946.

(122) *Acanthoxia gladiator* Westwood.

(*a*) Fr. Sud., S.L., B.C., Ug., Ken., T.T., S. Afr.

(*b*) Ibadan, Bamenda, Kalkala ; evidently widely distributed, but rare.

(*c*) Kalkala : only 7 adults seen, in Feb., 8 May, 4, 24, 27 June, 20 July and 9 Aug.

(*d*) At Kalkala *A. gladiator* is found in *Brachiaria* and *Pennisetum mollissimum*. Gwynn took 13 nymphs between 24 Aug. and 16 Nov., 8 of them (in the 3rd and 4th nymphal instars) between 22 and 26 Sept. The last two hoppers taken (on 3 Oct. and 16 Nov.) were both in the 5th instar.

At Ibadan the writer caught two adults near the river Awna on 9 Apr. and one in *Panicum* on 29 June ; Walker took one adult at Bamenda in Apr., 1942.

(123) *Mesopsera filum* Bolivar.

(*a*) B.C., Ug., T.T.

(*b*) Bamenda : one adult in Apr., 1942, and another in May, 1946.

(124) *Phyxacra strenua* Walker.

(*a*) Fr. Sud., A.E. Sud., Ug.

(*b*) See map No. 12 ; all to the north of 9° 30′ N.

(*c*) Kalkala : 15 June to 18 Oct. Other localities : Jan., Mar., May–July, Oct. and Dec.

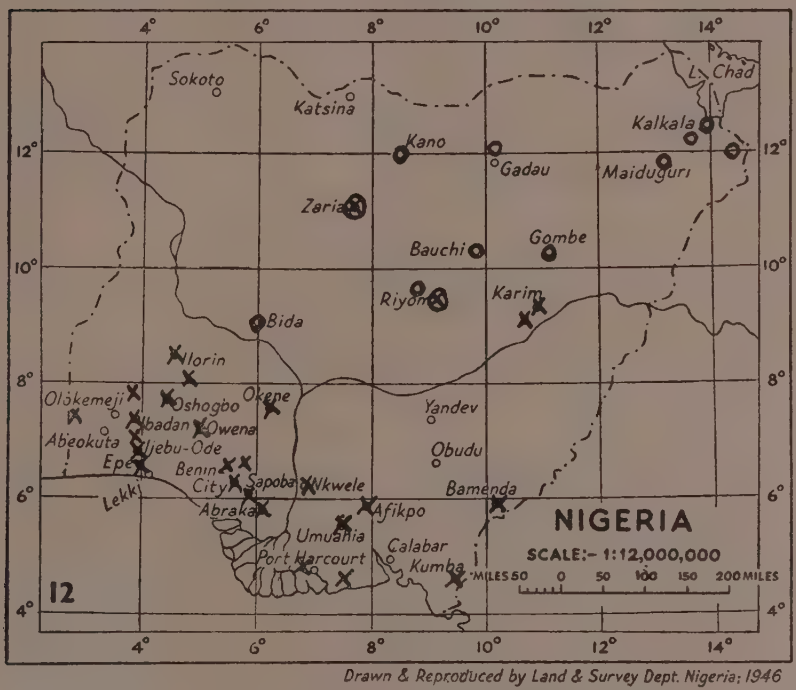
(*d*) Only 23 adults, nearly all in cotton fields, were found at Kalkala ; *P.*

strenua was abundant on *Guiera* at Marariya on 2 July, 1933, and Gwynn saw 22 adults at Kasa on 30 Oct., 1934. The writer found two pairs *in coitu* on 2 July, and Gwynn caught two small nymphs on 15 Sept. and three teneral adults on 15 Oct. This species was common at Zaria in June, 1938.

(125) *Orthacanthacris humilicrus* Karsch.

(*a*) A.E. Sud., E. Afr.

(*b*) Barakin Ladi, Zaria, Sokoto, Dikwa, Marte, Kalkala.



MAP No. 12.—Distribution of × *Euprepocnemis ibandana* G.-T. and ○ *Phyxacra strenua* Wlk.

(*c*) All localities : only 10 adults seen, in Apr.–July, Oct., and Dec.

(*d*) This species has been seen on cotton and trees ; nymphs have not been collected.

(126) *Anacridium moestum* Serville.

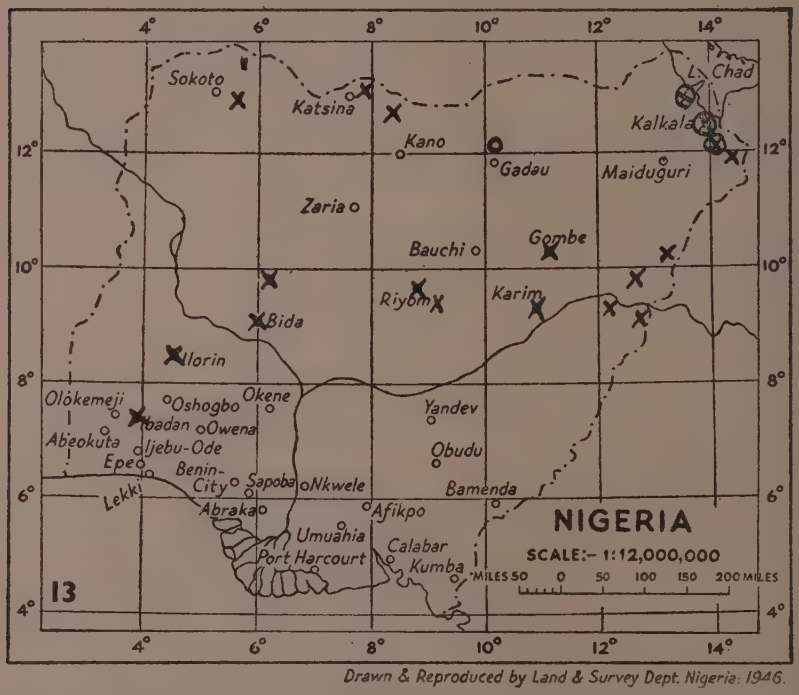
Both subspecies of the Tree Locust, viz. *melanorhodon* and *moestum*, occur in Nigeria. Uvarov (12) decided that *A. melanorhodon* Wlk. was not a true species and reduced it in rank to a subspecies of *A. moestum* Serv. ; Gwynn has informed the writer that he has found differences in the structure of the genitalia of the males of the two subspecies.

Unfortunately the writer was not aware of the differences between the two

subspecies when he made a preliminary survey of the shores of Lake Chad in 1931 and during the first survey period at Kalkala (Dec., 1932, to June, 1933), although he now knows that nearly all the *Anacridium* adults seen at Kalkala in 1933 were *moestum*.

(A) *Anacridium moestum melanorhodon* Walker.

(*a*) Fr. Sen., Fr. Sud., Central Sahara, A.E. Sud., Eritrea, Abyss., Aden, Sokotra, Nyasa., P.E. Afr., S. Afr. (East Cape Province).



Map No. 13.—Distribution of × *Anacridium moestum moestum* Serv. and ○ *A. m. melanorhodon* Wlk.

(*b*) See map No. 13 ; found only at Sherifuri, Chad (Abeli Ashettammari to Kalkala) and Gajibo.

(*c*) Kalkala : Gwynn found adults in June and Sept.–Nov., they were numerous on 13 Oct.

(*d*) Most of the adults were on cotton or trees. Gwynn found several teneral adults on 13 Sept. and 14 on 13 Oct. In Sept. and Oct., 1931, the writer found last instar nymphs of *Anacridium* at Mufio, Mongonu and Kauwa, and saw the final ecdysis on 17 Sept. and 3 Oct. Fourteen swarms of *melanorhodon* have been reported between Jan. and Apr., all in the area lying to the north of 11° N.

(B) *Anacridium moestum moestum* Serville.

(*a*) Fr. Sud., Fr. Tch., A.E. Sud., Ug., Ken., T.T., S. Rhod., S.W. Afr., S. Afr. (N.W. Cape Province and Transvaal).

(*b*) See map No. 13 ; with the exception of two adults taken at light at Ibadan and Ilorin all were to the north of 9° N.

(*c*) Kalkala : Gwynn found adults in May and Oct.–Dec. Other localities : Jan., Feb., Apr., May, Sept., Nov. and Dec.

(*d*) Found principally on Cotton and trees. At Kalkala, Gwynn observed that adults became abundant suddenly in the week ending 23 Nov., 1933, and he was inclined to suspect that a recent local migration had taken place. The writer found gravid females in early June, 1933.

Two small swarms of this subspecies were seen in the Balaha district (near Yola) in Feb. and Mar., 1947.

At light.—Ilorin, 16 Dec. ; Ibadan, 13 Apr. It is remarkable that these two individuals, the only specimens seen to the south of 9° N., were both caught at light ; it is probable that they were migrating.

(*e*) Total length : ♂ 56, ♀ 61 ; hind femur, ♂ 28, ♀ 30 mm.

A Note on the Distribution of *Anacridium moestum* subspp.

Uvarov (14) has described *melanorhodon* as a northerly form of *moestum*, and Johnston (8) also states that that subspecies " is to be regarded as a northern race in Africa." In both West Africa and the Anglo-Egyptian Sudan *A. m. moestum* is more numerous in the southerly areas, whilst, in East Africa, *A. m. melanorhodon* is present in northerly countries from which *moestum* has not been reported. Chapman (3) gives a map showing the " present known distribution " of *melanorhodon* in Africa, and suggests that it may be a coastal or damp climate form since all the records on his map are from coastal areas. He was apparently unaware of the existence of this subspecies in French Sudan, the Central Sahara and Northern Nigeria. He also suggests that *moestum* is a drier climate form ; but in Nigeria (and presumably the A.E. Sudan) it occurs in more humid southerly localities, from which *melanorhodon* is absent. It is correct to say that north of the Equator *melanorhodon* has a more northerly distribution than that of *moestum*. It is not improbable that they are distinct species.

(127) *Cyrtacanthacris aeruginosa* Stoll.

Two subspecies occur in Nigeria, viz. *unicolor* and *goldingi*.

(A) *C. a. goldingi* Uvarov.

(*a*) Fr. Tch., N. Rhod., S. Rhod.

(*b*) See map No. 14 ; found only in marshy areas near Chad and the river Benue.

(*c*) Kalkala : only 9 adults on 10 Jan., 7 Feb., 11, 21, 22 (3) Sept. and 10 (2) Oct. Gwynn took 11 adults at Wirge on 24 Oct. and about 16 at Gajibo on 1 and 2 Nov., the writer caught one adult each at Gusko on 10 Oct., Karim on 15 Sept. and Demsa on 11 Dec.

(*d*) *C. a. goldingi* is found in river marshes and, in the Chad area, occurs in *Sorghum aethiopicum* and mixed *Brachiaria* and *Echinochloa*. Gwynn found a teneral adult on 22 Sept. ; the hoppers have not been seen.

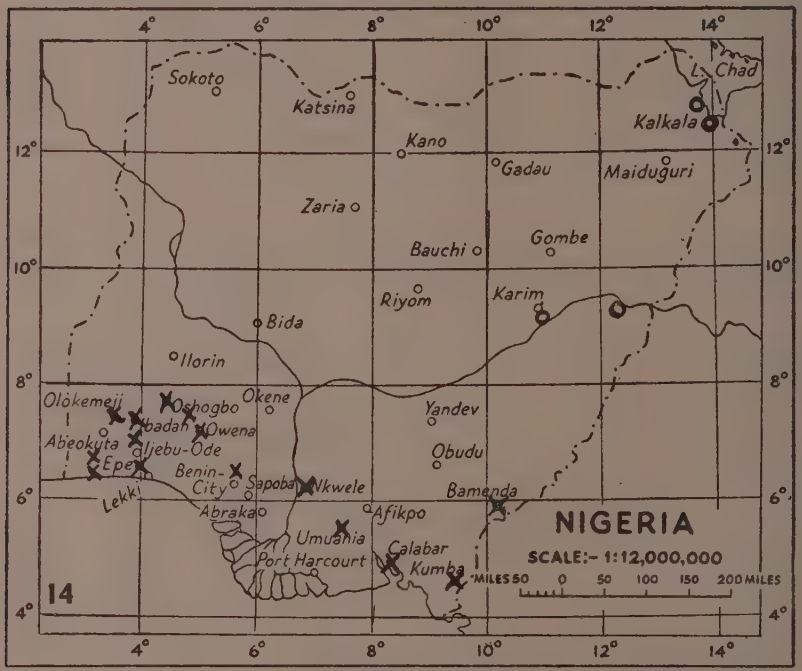
(B) *C. a. unicolor* Uvarov.

(*a*) S.L., G.C., B.C.

(*b*) See map No. 14; in or near the borders of the Forest Zone.

(*c*) Ibadan: throughout the year, most numerous from Mar. to July, and in Oct.–Nov.

(*d*) This phytophilous species feeds on dicotyledonous plants; adults and nymphs have been seen attacking cotton, while hoppers have been observed eating the leaves of aubergine, okra, *Zinnia* and *Aspilia*. Nymphs have been seen in Jan., Feb., Aug., Sept. and Oct.; teneral adults on 21 May, 7 June and 23 Sept.; adults were bred on 26 Jan., 16 Mar., 12 Sept., 11, 23 Oct. and 6 Nov.; gravid females were found on 6 Mar. and 28 Dec. There are



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Map No. 14.—Distribution of × *Cyrtacanthacris aeruginosa unicolor* Uv. and ○ *C. aeruginosa goldingi* Uv.

probably two generations a year. On 31 Mar., 1937, a large Sphegid was seen trying to drag a paralysed female into its burrow.

At light.—Ibadan, 4, 21 Apr.

(128) *Nomadacris septemfasciata* Serville.

The solitary phase of the Red Locust is known in Nigeria only from the Chad area and marshes in north-east Dikwa. It occurs in *Cymbopogon*, *Imperata*, *Sorghum aethiopicum*, *Brachiaria* and other grassy habitats; Gwynn took the hoppers principally in *Brachiaria*—*Echinochloa* and *Pennisetum mollissimum*.

(129) *Ornithacris cyanea* Stoll.

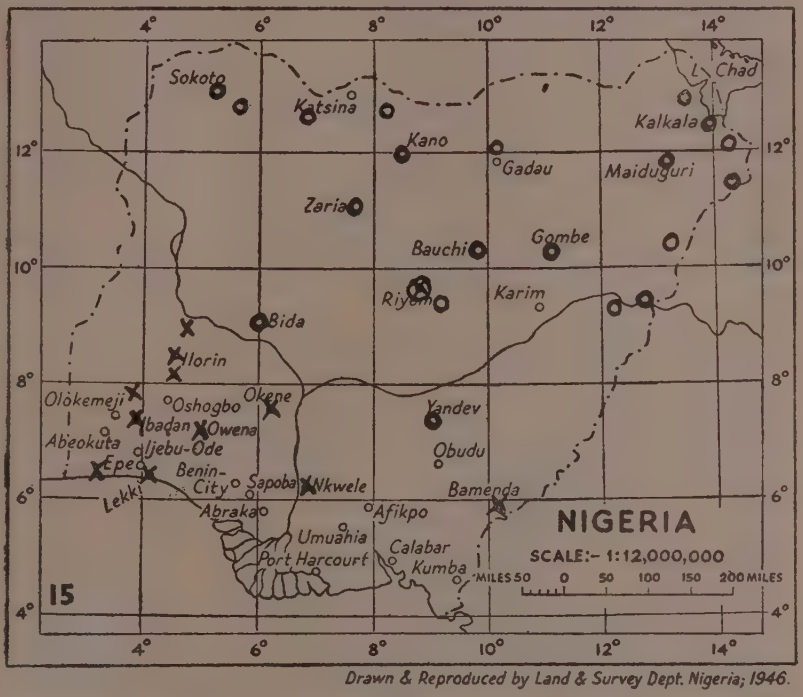
There are four subspecies in Nigeria, viz. *cavroisi*, *turbida* and two at present unnamed.

(A) *O. c. cavroisi* Fin.

(*a*) Fr. Sen., Fr. Sud., Gamb., P. Guin., S.L., G.C., Fr. Tch., A. E. Sud., Ug.

(*b*) See map No. 15 ; except for one specimen taken at Yandev all to the north of 9° N.

(*c*) Kalkala : throughout the year, least numerous from mid-June to early October.



MAP No. 15.—Distribution of ○ *Ornithacris cyanea cavroisi* Fin. and × *O. cyanea turbida* Wlk.

(*d*) This phytophilous species occurs most frequently in *Cymbopogon*, *Sorghum aethiopicum*, *Andropogon* and Cotton fields ; its choice of habitat seems to depend more on the height of the vegetation than on the humidity. The writer found gravid females on 12, 22 June, and saw oviposition taking place later in the month ; Gwynn found nymphs between 7 Aug. and 22 Oct. (also two last instar hoppers on 2 Dec. !) ; they were numerous from mid-Sept. to mid-Oct. ; he collected a teneral adult on 16 Oct. ; *coitus* was observed on 21 May and 11 June.

(B) *O. c. turbida* Walker.

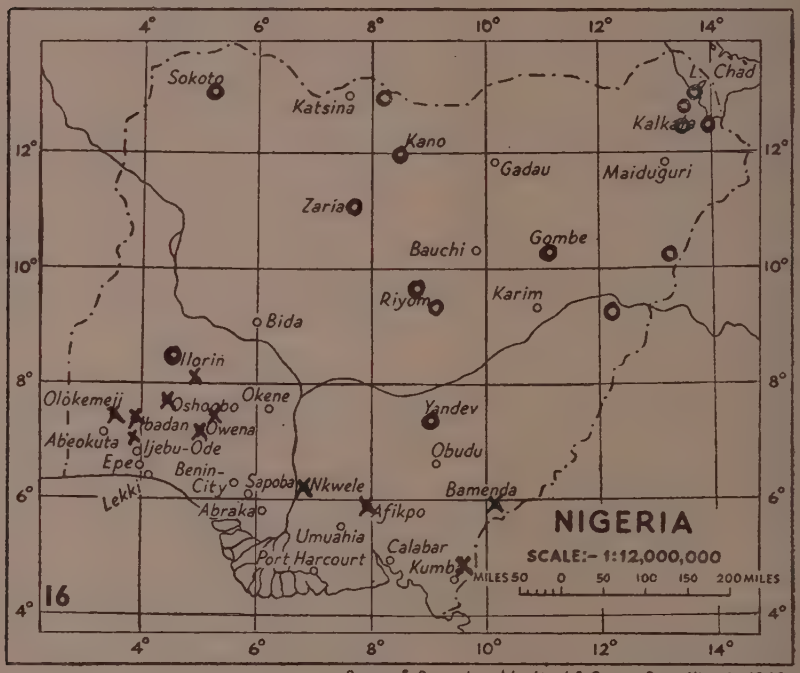
(*a*) S.L., G.C., Southern A.E. Sud., B.C., Ug.

(*b*) See map No. 15 ; all south of 9° 40′ N.

(*c*) Ibadan: seen between 18 Nov. and 19 Apr., most abundant in Jan. Ilorin and other more northerly localities: 17 Apr. to 10 May, Aug., Sept. and Dec.

(*d*) At Ibadan, *O. c. turbida* occurs in tall grass habitats and also in young *Panicum* (about 18 to 24 in. high). Hoppers have not been found; it is possible that there is a southerly migration to Ibadan and other localities in the Forest Zone when the north-easterly "harmattan" reaches Ilorin in Nov.

At light.—Ibadan, 7 Dec.



Map No. 16.—Distribution of ○ *Acanthacris ruficornis citrina* Serv. and × *A. r. ruficornis* F.

(c) *O. cyanea* subsp. 1.

Uvarov (16), when referring to *O. c. orientalis* Sjöst. mentions "a somewhat similar, but smaller and darker race known to me from Cameroons and left without subspecific designation." Eight adults taken by Bumpus at Bamenda in May, 1946, and three collected by Tallentire at Yandev in June, 1946, probably belong to this race; they have purple wings.

(d) *O. cyanea* subsp. 2.

Wilson caught one adult with violaceous wings at Zaria on 18 Jan., 1938; it was both larger and lighter in colour than subsp. 1.

(130) *Acanthacris ruficornis* Fabricius.

Two subspecies occur in Nigeria, viz. *ruficornis* and *citrina*.

(a) *A. r. citrina* Serville.

(*a*) Algiers, Morocco, Fr. Sen., Fr. Sud., Fr. Nig., G.C., A.E. Sud.

(*b*) See map. No. 16 ; widely distributed outside the Climatic Forest Zone.

(*c*) Kalkala : throughout the year, not common.

(*d*) *A. r. citrina* is usually found in cotton at Kalkala. The writer found gravid females in late June, while Gwynn saw two last instar nymphs on 3 and 14 Sept. ; the first was on the point of moulting, and the second was undergoing its final ecdysis. He also bred out an adult on 29 Oct. *A. r. citrina* was abundant at Gusko (in *Cymbopogon*) in Oct., 1931, and at Zaria in June, 1938. Four males collected at Yandev, the most southerly record, were rather sub-normal in size.

At light.—Ilorin, 30 Oct.

(B) *A. r. ruficornis* F.

(*a*) S. L., G.C., B.C., Ug., Ken., T.T., S.Rhod.

(*b*) See map No. 16 ; confined to the Climatic Forest Zone.

(*c*) Ibadan : only one adult found, on 22 Feb., 1923. Other localities : every month from Mar. to Sept. and in Dec.

(*d*) *A. r. ruficornis* occurs only in thick bush at Ibadan, and nearly all the remaining specimens came from well-wooded loci ; the wood at Oke Onigbin was the most northerly record. Two nymphs caught in thick bush at Ibadan became adult on 31 Mar. and 13 June ; they were both feeding on unidentified dicotyledonous shrubs. Gwynn has informed the writer that the nymphs of *A. r. citrina* are also almost certainly non-graminaceous feeders.

(131) *Rhytidacris tectifera* Karsch.

(*a*) S.L., B.C., A.E. Sud., Ug., Ken., T.T.

(*b*) Known only from Ibadan, where 8 adults were taken, on 3, 6 Feb., 15, 21 (2) Mar., 6, 27 Apr. and 14 May. Two were on grapefruit (on which one was feeding), two were in the laboratory and one was taken at light (on 6 Feb.).

(132) *Chondracris baumanni* Karsch.

(*a*) Fr. Sud., Togo., Fr. Cam.

(*b*) Epe, Olokemeji, Ibadan, Akure, Karim, Gidan Usumanu.

(*c*) Ibadan : only three adults seen, on 1, 9 June and 11 July. Other localities : May, June and Sept.

(*d*) At Ibadan the adults were found in *Imperata* and *Pennisetum purpureum* ; large red-winged grasshoppers were present in these habitats from Dec., 1946, to Mar., 1947 (they decreased in numbers each month). Every effort to capture one proved abortive—an event unique in the writer's experience ; he succeeded in getting within five yards of one adult and is confident that it was *C. baumanni*. There was no difficulty in catching this species at Olokemeji in May or at Karim in Sept., probably on account of the lower temperatures experienced during the rains. A pair was seen *in coitu* at Gidan Usumanu on 29 Sept., 1941.

(133) *Schistocerca gregaria* Forskål.

The writer collected three adults in northern Chad in Oct., 1931, but swarms were present in the preceding summer, and it is almost certain that they were derived from them.

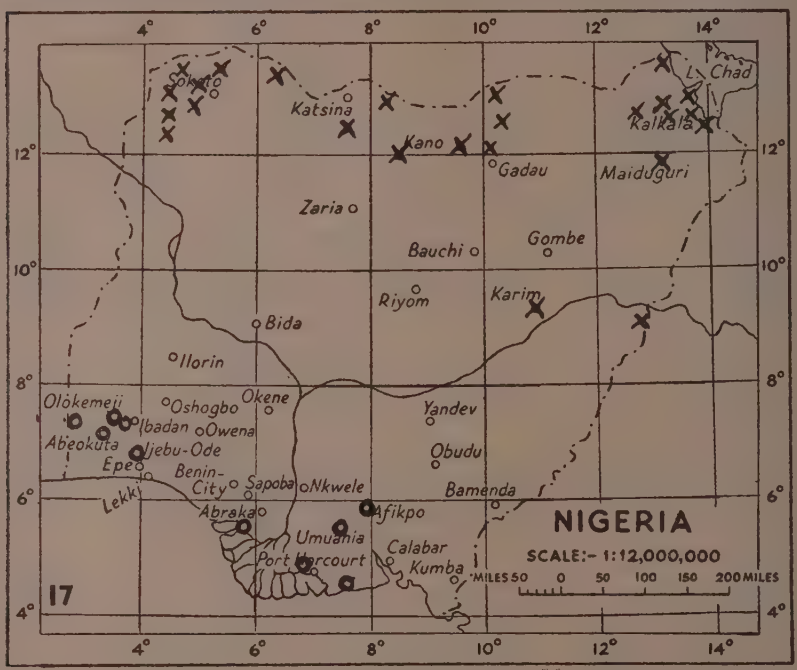
(134) *Kraussaria angulifera* Krauss.

(*a*) Fr. Sen., Gamb., Fr. Sud., Fr. Tch., A.E. Sud., Eritrea, Arabia.

(*b*) See map No. 17 ; widely distributed north of 12° N., also present near the river Benue in Adamawa.

(*c*) Kalkala : Gwynn found adults from 28 Aug. to 27 Nov. ; they were very abundant in mid-Oct. Other localities : 23 July to Dec.

(*d*) *K. angulifera* is a serious pest of Bulrush Millet in Sokoto, Katsina, Bauchi, Kano and Bornu Provinces. In Oct., 1931, the writer found it to be



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Map No. 17.—Distribution of × *Kraussaria angulifera* Kr. and ○ *Eupropacris coerulea* Dru.

one of the commonest grasshoppers in Chad ; when he reached Kalkala on 9 Nov. many of the adults were dead or moribund. Gwynn found nymphs from 18 July to 22 Sept. ; they were most numerous in the first half of Aug. ; he caught a teneral adult on 13 Oct., and observed pairs *in coitu* on 18, 21 Sept. and 30 Oct. There is an embryonic diapause from about Nov. to July. Large numbers of egg pods have been sent to the writer at Ibadan (from various localities), and adults have been reared there on several occasions. At Kalkala this species occurs most often in *Cymbopogon*, *Peristrophe*, *Urochloa*, Cotton and farmland.

(135) *Bocagella* sp.

The writer took one adult at Ilorin on 10 Dec., 1936.

(136) *Abisares viridipennis* Burmeister.

Uvarov (19) has distinguished five subspecies of *A. viridipennis*. Nigerian specimens are closest to *A. v. hylaeus* Rehn, which has been recorded from Fr. Cam., B. C., Ug., and T.T.

(*b*) Ijebu-Ode, Gambari, Ibadan, Afikpo—all these localities are in the Forest Zone.

(*c*) Ibadan : only 17 adults seen, between 5 Mar. and 22 June. Other localities : 10 adults between 16 Jan. and 19 May.

(*d*) At Ibadan this species occurs in thick bush. An adult was bred on 6 Mar. ; there is probably an embryonic diapause from about June to Oct. or Nov. An adult was seen feeding on *Triumfetta* at Ibadan.

(137) *Eucoptacra anguliflava* Karsch.

(*a*) S.L., Togo., B.C., Ug.

(*b*) This small, inconspicuous species was found in many localities in the south-western area, at Umuahia, Bamenda, Obudu, Gadau, and Sherifuri. It is probably widely distributed to the south of 12° 10′ N.

(*c*) Ibadan : only 25 adults have been seen, between 19 Feb. and 8 Oct. ; they were most numerous in May–June and Sept.

(*d*) A gravid female was found at Ibadan on 13 Sept. Adults have been seen feeding on *Zinnia* and *Anthocleista*.

(138) *Cypherocerastis* sp.

Attah took one adult at Mambong, near Kumba (Cameroon Province) on 22 July, 1946.

(139) *Epistaurus bolivari* Karny.

(*a*) A.E. Sud., Ug.

(*b*) Obudu, Barakin Ladi, Bida, Bauchi, Gadau, Sherifuri.

(*c*) All localities : only 13 adults, between 2 Apr. and 7 Aug.

(140) *Epistaurus succineus* Krauss.

(*a*) Fr. Cam., S. Afr. (Natal).

(*b*) Found only in the Climatic Forest Zone.

(*c*) Ibadan : throughout the year.

(*d*) At Ibadan this small species is most often found on *Aspilia* ; several adults and one large nymph (on 27 Sept.) have been seen feeding on either the flowers or leaves of this plant. A gravid female was found on 29 Sept., and an adult was bred on 1 Aug.

(141) *Epistaurus* sp.

The writer found 13 adults of an unidentified species of *Epistaurus* at Ibadan in Jan.–Apr. and July–Oct.

(142) *Eupropacris coerulea* Dru.

(*a*) S.L., G.C., B.C.

(*b*) See map No. 17 ; found only in the Forest Zone.

(*c*) All localities : Mar.–Sept. and Dec.

(*d*) This species occurs in thick bush and has been found feeding on *Cissampelos*. A curious feature of its local distribution is that it appears to be completely absent from the vicinity of Moor Plantation, Ibadan, although it is not uncommon 7 miles to the west. The hoppers have not been found.

(143) *Anthermus violaceus* Bolivar.

Wilson took one adult at Barakin Ladi on 8 Apr., 1946.

(144) *Catantops annulatus* Krauss.

(*b*) Ilorin, Zaria, Bauchi, Sherifuri.

(*c*) Lloyd took 22 adults at Sherifuri; the writer caught 3 adults at Ilorin on 12, 14 and 19 Dec., and received 6 from Bauchi and Zaria (taken in May–July).

(145) *Catantops axillaris* Thunberg.

(*a*) Fr. Sen., Fr. Sud., Fr. Tch., A.E. Sud., Br. Som., Egypt, S. Arabia, Sokotora.

(*b*) Chad (Abeli Ashettammari to Wulgo), Gajibo, Maiduguri.

(*c*) Kalkala: throughout the year. rare from early July to early Sept.

(*d*) At Kalkala, *C. axillaris* occurred in the drier habitats and was often found in *Cymbopogon* and old farmland. The writer found a number of gravid females during the last 10 days of June, and noticed that after the beginning of the rains there was a remarkable change in adult coloration, which became generally darker (see Maxwell-Darling, 10). Gwynn saw hoppers between 18 July and 24 Sept.; they were most numerous between 8 Aug. and 22 Sept. This species is very common in the Chad area; adults were seen feeding on Cotton and Okra at Gusko.

At light.—Kalkala, 13, 23, 27 May, 11, 16, 18 June.

(146) *Catantops basalis* Walker.

(*a*) Fr. Sud., S.L.

(*b*) The writer took one adult at Zaria on 14 July, 1931, and a second at Ilorin on 18 Dec., 1936.

(147) *Catantops dubiosus* Sjöstedt (?).

Bumpus took 19 adults at Bamenda in May, 1946; Walker caught one in the same locality in Apr., 1942.

(148) *Catantops haemorrhoidalis* Krauss.

(*a*) Fr. Sen., Fr. Sud., Fr. Tch., A.E. Sud.

(*b*) To the north of 10° N.

(*c*) Kalkala: throughout the year.

(*d*) At Kalkala this species occurs in *Cymbopogon*, cotton fields and farmland and *Peristrophe*. Gwynn saw hoppers between 18 Aug. and 29 Sept. (and one on 18 Nov.); they were very abundant on 29 Sept. at Kauwa. The writer saw a female just about to oviposit in a cotton field on 22 June, 1933. Gwynn saw a nymph feeding on *Leucas* on 18 Nov., 1933.

At light.—Maiduguri, 21 (many) May.

(149) *Catantops melanostictus* Schaum.

(*a*) Fr. Sud., S.L., G.C., A.E. Sud., B.C., Ug., Ken., T.T., S. Rhod., S. Afr.

(*b*) Widely distributed, but absent from Chad.

(*c*) Ibadan : throughout the year, common in June, rare from Dec. to Feb.

(*d*) At Ibadan this species has been found in short grass and on bush paths. Teneral adults were taken on 2, 16, 24 (several) June ; adults were bred on 30 July and 17 Sept. ; gravid females seen on 25 Aug., 15, 29 Sept. and 13 Nov. There appear to be two generations a year. Adults have been seen feeding on cabbage, tobacco, turnips, *Zinnia*, *Verbena* and *Bryophyllum*.

(150) *Catantops mellitus* Karsch.

(*a*) Togo. ; data incomplete.

(*b*) Three adults were taken at Owena on 26 Jan. and 9, 15 Mar.

(151) *Catantops minimus* Karny.

(*a*) Ug., T.T.

(*b*) Barakin Ladi, Zaria and Bauchi ; 10 adults between 5 Apr. and 10 July.

(152) *Catantops modicus* Karsch.

(*a*) S.L., G.C., Togo., A.E. Sud.

(*b*) Umuahia, Benin, Ijebu-Ode, Ibadan, Okene.

(*c*) Ibadan : only 3 adults, on 11 (2) Apr. and 1 May. Other localities : 6 adults in Jan., Mar., Apr., May, July.

(*d*) At Ibadan all three adults were found under trees, two of them in a Cacao farm ; *C. modicus* is probably more numerous in the " true forest zone."

(153) *Catantops notatus* Karsch.

(*a*) Fr. Guin., S.L., Fr. Cam., A.E. Sud., B.C.

(*b*) Umuahia, Ibadan, Okene, Bauchi ; widely distributed, but rare.

(*c*) Only 8 adults taken in all localities, between 12 May and 15 Aug. Attacks Bananas in Fr. Guin.

(154) *Catantops plagiatus* Uvarov.

(*a*) B.C.

(*b*) Lloyd took 6 adults at Sherifuri.

(155) *Catantops praemonstrator* Karsch.

(*a*) Gamb., G.C., Togo., A.E. Sud., B.C., Ug.

(*b*) Lloyd took 2 adults at Sherifuri.

(156) *Catantops quadratus* Walker.

(*a*) B.C., Ug.

(*b*) Roebuck caught one adult at Kumba on 12 Sept., 1936.

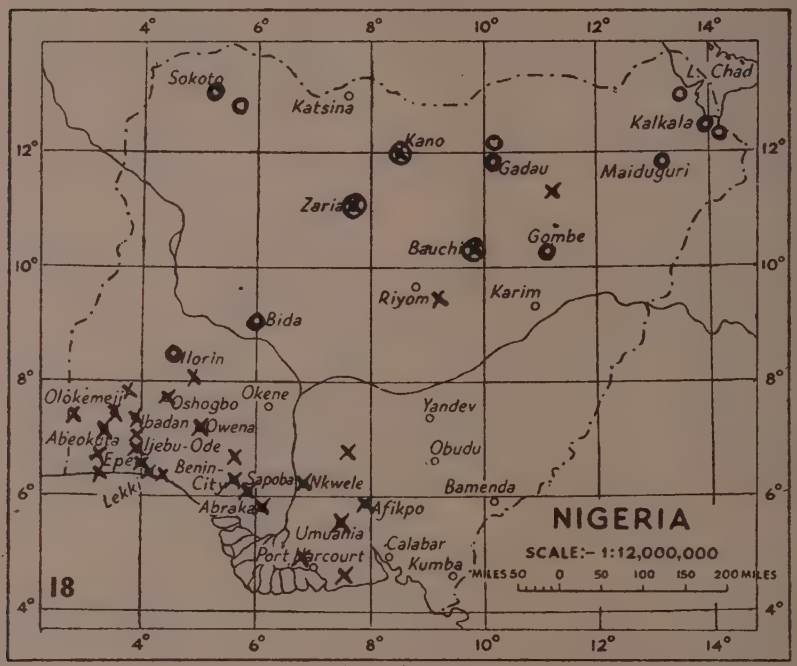
(157) *Catantops simplex* Uvarov.

(*a*) A.E. Sud., Ug., Ken.

(*b*) See map No. 4 ; found in the Climatic Forest Zone and at Ilorin and Bida.

(*c*) Ibadan: only 20 adults seen; in every month except June; most numerous in Mar., May and July–Aug.

(*d*) *C. simplex* is most abundant in well-wooded areas and is sometimes found on Cacao farms. Nymphs were found at Owena on 23 Aug. and 16 Dec., and Ibadan on 28 Dec.; there are probably two generations a year. Adults and nymphs have been seen feeding on *Solanum* and other adults on Cacao and Sunflower.



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Map No. 18.—Distribution of × *Catantops spissus* Wlk. and ○ *C. stylifer* Kr.

(158) *Catantops spissus* Walker.

(*a*) S.L., G.C., A.E. Sud., B.C., Ug.

(*b*) See map No. 18; a common species in the Climatic Forest Zone; only a few adults taken in northern localities; absent from Chad.

(*c*) Ibadan: throughout the year; most numerous in Jan., May and Sept.

(*d*) At Ibadan *C. spissus* is common in gardens, where it attacks many plants, especially *Canna*; nymphs were found eating leaves of cacao and *Aspilia* in the field. Hoppers have been found in Jan., Apr., May, Nov. and Dec.; teneral adults in May (3), June (4), Aug., Nov. (2) and Dec. (2); adults were bred in Jan., May, June (2), July, Aug. and Sept. Nymphs were most abundant in Apr.–May. There are at least two generations a year at Ibadan. Of the 8 adults taken in the north, it is certain that the 3 from Riyon and

Fika belonged to this species. It is possible that some of the 5 from Zaria, Bauchi and Kano were *praemonstrator*; they were received in 1936 and appeared to the writer to be *spissus*, but he was not then aware of the similarity between the two species.

At light.—Fika, 28 Feb.

(159) *Catantops stylifer* Krauss.

(*a*) Fr. Sen., Fr. Sud., Gamb., P. Guin., Fr. Guin., Fr. Sud., G.C., Togo., A.E. Sud., Ug.

(*b*) See map No. 18; to the north of 8° 29′ N.

(*c*) Kalkala: throughout the year, but only a few adults seen each month.

(*d*) At Kalkala this species occurred principally in the dry habitats, such as *Cymbopogon*, *Chloris* and *Peristrophe*. Gwynn took a nymph on 28 Aug.

At light.—Kalkala, 23 (2) May; Maiduguri, 21 (2) May.

(160) *Catantops togoensis* Ramme.

Only 5 adults taken, one at Ilorin on 14 Dec. and four at Bauchi on 11 (3) and 13 May.

(161) *Catantopsilus taeniolatus* Karsch.

(*a*) Togo.

(*b*) Widely distributed to the south of 12° N., but not common.

(*c*) Ibadan: only 29 adults seen; in every month except Feb. and Nov.; most numerous in June.

(*d*) At Ibadan this species has been seen feeding on *Aspilia* flowers. Nymphs were found on 5 Jan., 15 May, 7 June and 22 July; a teneral adult on 22 July; adults were bred on 16 Jan. and 18 Sept.; *coitus* was observed on 20 and 21 Apr. There are at least two generations a year.

(162) *Stenocrobylus festivus* Karsch.

(*a*) S.L., B.C., S. Rhod.

(*b*) Found only in the Climatic Forest Zone.

(*c*) Ibadan: only 21 adults seen, between 14 Feb. and 18 Nov.; most numerous in Aug.

(*d*) Adults and nymphs have been seen feeding on guava and *Ficus*; adults were also observed on Mango and *Salvia*. At Ibadan the black and orange hoppers of this species were found on 9 Mar., 27 Apr., 12, 16, 17, 22, 23 June. 3, 27 July and 12, 13 Aug.; an adult was bred on 28 June. There are probably two generations a year. This species is more abundant at Benin and Umuahia.

(163) *Staurocleis magnifica occidentalis* Uvarov.

(*a*) S.L.

(*b*) Ilorin, Riyom, Zaria and Bakura.

(*c*) Only 10 adults have been taken, in Jan., Feb., Apr., May, July (4), Oct. and Dec. In May and June, 1936, a number of nymphs were received from Zaria, Bida, Yandev and other localities in the north; these are thought to have been *S. m. occidentalis*.

(164) *Acorypha* sp. n.

(*a*) A.E. Sud.

(*b*) Ilorin, Yandev, Bida, Bauchi, Gadau, Sokoto.

(*c*) All localities: 28 adults taken in Apr., May (8), June (16), July and Dec. (2).

(165) *Acorypha picta* Krauss.

(*a*) Fr. Sen., Fr. Sud., Fr. Nig., Fr. Tch., A.E. Sud.

(*b*) Bida, Sokoto, Kazaure, Daura, Sherifuri, Maiduguri, Kalkala; with the exception of Bida (9° 30′ N.) all these localities are to the north of 11° 45′ N.

(*c*) Kalkala: Jan.–July, Oct. and Dec. Other localities: Jan., May–Aug., Nov., Dec.

(*d*) At Kalkala *A. picta* is found most often in *Peristrophe*, old farmland, Cotton and *Cybopogon*. The writer found gravid females in late June and Gwynn collected hoppers on 2 (2) Aug. and 17, 18 Oct.

(166) *Caloptenopsis glaucopsis* Walker.

(*a*) Fr. Sen., Fr. Sud., A.E. Sud., India.

(*b*) Lloyd took one female at Sherifuri.

(167) *Caloptenopsis insignis clarus* Walker.

(*a*) Fr. Sen., Fr. Tch., A.E. Sud., India.

(*b*) Maiduguri, Chad (Abeli Ashettammari to Wulgo).

(*c*) Kalkala: throughout the year, rare mid-July to mid-Oct.

(*d*) This common species is usually found in *Peristrophe*, *Cymbopogon* and old farmland at Kalkala. The writer saw gravid females on 26 May, 10 (2), 13, 26 (2) June. Gwynn found nymphs from 19 Aug. to 7 Dec.: they were most abundant in mid-Oct.; he caught 3 teneral adults on 13 Oct.

At light.—Maiduguri, 21 (3) May.

(168) *Caloptenopsis marginipennis* Karsch.

Four adults were collected at Zaria between 31 May and July.

(169) *Caloptenopsis* sp. n.

(*b*) Zaria, Kalkala.

(*c*) Kalkala: 48 adults seen between 17 Sept. and 10 Feb.; rare after 22 Nov.

(*d*) At Kalkala this species is most often found in *Brachiaria* and *Chloris*. Gwynn took 18 hoppers between 17 Sept. and 21 Oct. Two adults were collected at Zaria on 21 Oct. and 13 Jan.

(170) *Caloptenopsis unicarinatus* Krauss.

(*a*) Fr. Sen., A.E. Sud.

(*b*) The writer took one adult on the top of a rocky hill at Share on 8 May, 1937.

(171) *Caloptenopsis voltaensis* Sjöstedt.

(*a*) Fr. Sud., A.E. Sud.

(*b*) Gwynn took one adult at Ngala on 26 Oct., 1934: another was collected at Kano on 11 Oct., 1937.

(172) *Tylotropidius gaugeri* Schulthess.

(*a*) S.L., G.C., A.E. Sud., P.E. Afr.

(*b*) Barakin Ladi, Bida, Bauchi, Zaria, Zurmi, Sokoto, Sherifuri, all to the north of 9° 30′ N.

(*c*) All localities: 22 adults seen, in Jan (3), Apr. (4), May (4), June (4), July and Dec. (6).

(*d*) Three teneral adults were taken at Zaria on 15 Dec., 1946.

(173) *Tylotropidius laxus* Karsch.

(*a*) G.C.

(*b*) Isoba, Afikpo, Enugu, Benin, Ibadan, Oshogbo, Bida, Ilorin, Kazaure, Gadau, Riyom: widely distributed, but not common; absent from Chad.

(*c*) Ibadan: only 17 adults seen, between 5 Nov. and 18 Apr. Other southern localities: 12 adults between 21 Nov. and 29 Apr.

(*d*) At Ibadan *T. laxus* frequents *Panicum* and other tall grass habitats. A large nymph was found on 5 Nov., and *coitus* was observed on 18 Apr. It is possible that, in the south, there is an embryonic diapause during the rains; but the absence of adults from May to Oct. may be due to the difficulty of finding them in the luxuriant growth of the grass in those months. An adult was taken at Oshogbo on 1 June, and Nash took another at Gadua on 30 July.

(174) *Tyloptropidius speciosus* Walker.

(*a*) Fr. Sud., S.L., A.E. Sud., Ug., Ken., T.T.

(*b*) Umuahia, Abraka, Obudu, Ibadan, Barakin Ladi, Zaria, Bauchi, Ringim, Gajibo, Kalkala.

(*c*) Kalkala: only 19 adults seen, between 21 Oct. and May, most numerous in late Oct. Southern localities: 11 adults between 12 Dec. and 14 May. Zaria: 15, 17 (3) Dec., 13 Jan., 25 June and 7 July.

(*d*) At Kalkala this species was most often found in *Chloris* and *Cymbopogon*; Gwynn took 4 nymphs on 28 Aug., 17 Sept. and 13, 17 Oct. The only two specimens seen at Ibadan were in recently burnt tall grassland on 12 Mar., 1942. *T. speciosus* was common at Barakin Ladi in early Apr., 1946, and at Abraka on 12 Dec., 1941.

(175) *Tylotropidius* sp.

(*b*) Daura, Maiduguri, Chad (Abeli Ashettammari to Kalkala).

(*c*) Kalkala: throughout the year, rare from 20 July to mid-Oct.

(*d*) This species is very abundant in the Chad area. At Kalkala it is found most frequently in *Cymbopogon*, *Chloris*, *Peristrophe* and old farmland. The writer found a gravid female on 26 May; *coitus* was seen on 5, 11, 12 and 26 June; Gwynn saw nymphs between 7 Aug. and 22 Dec. (most numerous between mid-Sept. and mid-Oct.), and the writer found 19 hoppers between 22 Dec. and 2 Mar.

At light.—Maiduguri, 18, 19, 21 (2) May.

(176) *Cataloipus cymbiferus* Krauss.

(*a*) Fr. Sen., Fr. Sud. ; data incomplete.

(*b*) Ijebu-Ode, Benin, Nkwele, Enugu, Owena, Mamu, Gambari, Ibadan, Ilorin, Zaria, Karim, Sokoto.

(*c*) Ibadan : only 4 adults seen on 8, 10 May, 28 July and 15 Oct. Other localities : about 50 adults, in each month from Mar. to Dec.

(*d*) Eight adults were found in *Cynodon* on 5 June, 1946, at Mamu ; they are common at Owena, and were fairly numerous on 6 Sept., 1941, in short grass at Zaria. A pair was seen *in coitu* at Owena on 16 Aug., 1939.

(177) *Cataloipus fuscocoerulipes* Sjöstedt.

(*a*) Fr. Sud., Fr. Tch.

(*b*) Chad (Gimeri, Kalkala).

(*c*) Kalkala : Sept., Oct., Jan., in *Brachiaria* and *Echinochloa* in the river Yedseram delta.

(178) *Cataloipus* sp. n.

(*b*) Chad (Gimeri, Kalkala).

(*c*) Kalkala : Sept., Oct., Jan.

(*d*) This species is found principally in *Sorghum aethiopicum* and *Pennisetum mollissimum*.

A Note on the Two Chad spp. of *Cataloipus*.

Neither Gwynn nor the writer differentiated between these two species during their survey work at Kalkala in 1933 ; Gwynn finally recognized that there were two species present on 17 Sept., 1934, or about one month before the end of his second survey period. Both he and the writer collected a number of data which refer to both species. Gwynn found hoppers of *Cataloipus* spp. between 5 July and 21 Sept. ; they were most abundant from mid-July to mid-Aug. ; he collected adults from 7 Aug. to 6 Dec. ; they were numerous in late Aug. The notes given by the writer (5) under the heading *Cataloipus* sp. n. are now known to have referred to both species. Both were represented amongst the 8 adults he collected at Kalkala in the first week of Jan., 1933 ; these were the only specimens of *Cataloipus* he met with between 1 Jan. and 30 June, 1933. On 14 Nov., 1931, he found many *Cataloipus* adults, nearly all *in coitu*, in grass surrounding a pool at Dongo. Specimens belonging to this genus were taken at Bisagana, Baga Seyoram and Gusko in Oct., 1931. It seems evident that the bionomics of the two species are similar, and that each has a long embryonic diapause from about late November to June or July ; all the adults have died before mid-Jan.

(179) *Thisoicetrus harterti* I. Bolivar.

(*a*) Fr. Tch., A.E. Sud.

(*b*) Sokoto, Chad (Kauwa to Kalkala).

(*c*) Kalkala : seen in each month from 4 Apr. to 13 Nov., common Apr.–June and late Sept. Sokoto : two adults on 16, 19 June.

(*d*) At Kalkala this species occurred in the dry habitats (cotton, old farmland, *Peristrophe* and *Cymbopogon*) ; it is also found on *Calotropis*. The writer

caught two last instar nymphs on 4 Apr., and hoppers were present up to 10 June. Gwynn found nymphs between 5 July and 15 Sept.; they were most numerous between 28 Aug. and 15 Sept. The writer collected teneral adults on 4 (4), 11 (3), and 17 Apr.; adults were bred on 13, 14, 17, 21 Apr. and 5, 21 May; gravid females and some which had already oviposited were found on 3 May. There are two generations a year; one becomes adult in Apr.–May and the other in late Sept.-Oct.

At light.—Kalkala, 20, 21 Apr., 13, 23 May, 13 June.

(180) *Thisoicetrus leani* Uvarov.

(*a*) Fr. Sud.

(*b*) Bida, Zaria, Kano, Nahuce, Bauchi, Chad (Gusko to Kalkala).

(*c*) Kalkala: Gwynn found adults from 31 July to 18 Oct.; they were most abundant in late Sept. Other localities: 20 July to 7 Oct.

(*d*) At Kalkala this species was found in *Peristrophe*, *Urochloa* and old farmland. Gwynn took nymphs between 18 July and 8 Aug.; they were numerous on 31 July. There is evidently a long embryonic diapause from about early Oct. to May. Gascoigne found an adult and a last instar nymph on Bulrush Millet at Nahuce on 15 Sept.

(181) *Thisoicetrus pulchripes* Schaum.

Three varieties of this species occur in Nigeria.

(A) *T. pulchripes* var. *guineensis* Kr.

(*a*) G.C., San Thome, Ken.

(*b*) Kumba, Afikpo, Benin, Owena, Epe, Abeokuta, Olokemeji, Mamu. Ijebu-Ode, Ibadan; all in the Forest Zone.

(*c*) Ibadan: only 4 adults seen, on 23 Mar., 21 Apr. and 1, 12 May. Other localities: 21 adults in Jan., Mar., Apr. (6), May (5), June (4), Aug., Sept. (2) and Oct.

(*d*) *T. p. guineensis* is found in thick bush at Ibadan. It was most numerous at Afikpo, Benin and Mamu.

(*e*) Total length: ♂ 25·5, ♀ 41; hind femur, ♂ 16·5, ♀ 24 mm.

(B) *T. pulchripes* var. *coerulipes* Sjöstedt.

(*a*) T.T.

(*b*) Only 5 adults seen, two at Ibadan on 26 Feb. and 11 Apr., two at Owena on 16, 18 Mar., and one at Olokemeji on 22 May.

(C) *T. pulchripes* var. *jeanneli* Bolivar.

(*b*) Owena, Mamu, Gambari, Olokemeji, Ibadan, all in the south-west corner of Nigeria.

(*c*) Ibadan: seen between 18 Mar. and 17 June. Other localities: collected between 13 Mar. and 15 June.

(*d*) At Ibadan this grasshopper is found in thick bush; it was common on 23 Mar., 1939. The adult taken on 17 June was very worn; it seems probable that there is an embryonic diapause from about May to Dec. or Jan. Three teneral adults were caught at Olokemeji on 13 Mar., 1947. *T. p. jeanneli* is not uncommon at Owena, and males were numerous at Olokemeji on 22 May, 1946.

(182) *Euprepocnemis ibandana* Giglio-Tos.

(*a*) S.L., B.C., Ug., Ken., T.T., PE. Afr.

(*b*) See map No. 12 ; widely distributed in the Climatic Forest Zone ; also found at Karim, Barakin Ladi and Zaria.

(*c*) Ibadan : 35 adults found between 6 Jan. and 22 Nov. ; most numerous in Mar., June and Oct. Occurs in Dec. elsewhere ; probably present throughout the year at Ibadan.

(*d*) At Ibadan *E. ibandana* is usually found in grass, e.g. *Panicum*, growing near the river Awna or its tributaries. A last instar nymph was taken on 28 June ; an adult was bred on 11 Aug. ; gravid females seen on 9 Mar., 23 May, 29, 30 Sept. and 14 Oct. ; *coitus* observed on 14 Oct. There are probably two generations a year. Last instar hoppers were found at Oshogbo on 6 June and at Sapoba in July and Aug. This species is common at Sapoba, Owena and Umuahia. Specimens taken at Bamenda by Bumpus in May, 1946, were smaller than those from elsewhere, and also had relatively shorter wings.

(183) *Euprepocnemis plorans* Charpentier.

(*a*) Fr. Sud., Fr. Tch., A.E. Sud., Egypt, S. Europe, W. Asia, India, Japan.

(*b*) Chad (Abeli Ashettammari to Wulgo), Gajibo, Kasa, Ngala ; known only from N.E. Bornu.

(*c*) Kalkala : throughout the year, most numerous from mid-Sept. to mid-Oct. Gwynn found many adults in northern Chad in late Dec.

(*d*) At Kalkala this species is found most often in *Brachiaria* and *Echinochloa* in the river marshes. Gwynn collected nymphs between 4 June and 21 Oct.—they were most abundant in June ; he caught a teneral adult on 17 Sept. The writer (5) stated that there were probably three species of *Euprepocnemis* at Kalkala, and that separate data for each species were not available ; it is now known that there were only two species present, viz. *plorans* and a rare species which appears to be new to science. The following data almost certainly refer to *plorans* : adults were rare after the end of Jan., but some were seen each month (Feb. to June) ; two nymphs were found on 29 Apr., one of which became adult on 9 May.

At light.—Kalkala, 18 Jan., 23 (3), 25 (2), 28 May, 11 June.

(184) *Euprepocnemis* sp. n.

(*b*) Kalkala, Ngala, Gajibo.

(*c*) Kalkala : Gwynn took 20 adults between 13 July and 24 Oct.

(*d*) Gwynn says that this species was more commonly found in the inland habitats at Kalkala ; he caught two hoppers on 8 Aug. and 15 Sept., and saw a pair of adults *in coitu* at Gajibo on 1 Nov. He mentions that this species was fairly numerous in *Sorghum aethiopicum* at Ngala on 27 Oct.

At light.—Kalkala, 13 July.

(185) *Phyllocercus bicoloripes* Uvarov.

(*a*) Fr. Sud.

(*b*) Gadau, Chad (Mongonu, Kalkala).

(*c*) Kalkala : Gwynn took 10 adults, mostly in *Brachiaria*, between 17 and

25 Sept.; the writer caught one adult at light at Mongonu on 28 Sept., 1931, and Nash took one at Gadau on 4 Aug., 1937.

(186) *Amphiprosopia gwynni* Uvarov.

(*b*) Chad (Mongonu to Kalkala), Gajibo, Kasa.

(*c*) Kalkala: Gwynn found adults between 3 Sept. and 2 Nov.

(*d*) This species was common between mid-Sept. and mid-Oct., and occurred principally in *Brachiaria* and *Echinochloa*. Gwynn found 4 nymphs (3 of them in the last instar) on 8.Aug. and one teneral adult on 5 Sept.; he saw a pair *in coitu* on 21 Oct. There is evidently a long embryonic diapause from about Oct. to June. There are brachypterous and macropterous forms in each sex.

At light.—Kalkala, 6, 10 Sept.

(187) *Bibulus coerulescens* St.

(*a*) A.E. Sud., T.T.

(*b*) Sapoba, Ibadan, Oshogbo, Kalkala; widely distributed, but rare.

(*c*) Kalkala: seen between 5 June and 8 Aug.; most numerous in late June. Southern localities: only 5 adults, on 14 May, 5 June and Sept. (3).

(*d*) At Kalkala this species was found most often in cotton, *Cymbopogon*, and on a thorn hedge round the laboratory. The writer collected gravid females in late June, and Gwynn bred an adult on 5 June. There is evidently a long embryonic diapause from about July to Apr.

At light.—Oshogbo, 5 June; Kalkala, 24 June.

(188) *Carydana agomena* Karsch.

(*b*) Ibadan, Oshogbo.

(*c*) Ibadan: taken in every month except Aug.; most numerous in Oct.

(*d*) The wings of this small species are rudimentary. It is found on *Panicum*, *Pennisetum purpureum*, *P. polystachon* and *Paspalum scrobiculatum*, and has been seen feeding on the first two of these grasses. *Coitus* was observed on 17, 21 Feb., 12 Oct., 8 Nov. and 14 (2) Dec. There are probably two generations a year.

(189) *Glauningia macrocephala* Ramme.

Only two adults have been taken, one at Owena on 19 Dec., 1941, and one at Benin on 19 Apr., 1946.

(190) *Pododula ancisa* Karsch (?).

The writer found 3 adults in tall grass at Karim on 24 (2), 26 Sept., 1941; those seen on 24 Sept. were *in coitu*. This species has rudimentary wings, and is not likely to be recognized as an adult grasshopper by the layman.

(191) *Hemiacris uvarovi* Ramme.

Roche took one adult at Obudu on 31 Mar., 1945; Uvarov (18) mentions another specimen from Northern Nigeria, and says that grasshoppers of the *Euthymiae*-group ecologically "belong to the fauna of relatively light mesophilous tropical forests, and more particularly to that of dry open forests and isolated trees of the savanna areas."

IX. Analysis of Data in Section VIII.

About 200 species are mentioned in the preceding Section, and of these 77 are rare. The following analysis is based mainly on the data available for the commoner species.

(a) *Local Distribution.*

A summary of the local distribution of 87 species and 5 subspecies is given in Table VI ; for some species the degree of latitude representing either their northern or southern limit is shown in brackets. W.D. represents "widely distributed," "T.F.Z." the "true forest zone," F.Z. the Forest Zone and C.F.Z. the Climatic Forest Zone.

Table VI.

(i) Chad Only.

Amphicremna scalata.
Acridella spp.
Calephorus sp.
Orthochtha sp. n.
Macrocymochtha speciosa.
Ochrilidia spp.
Stenohippus bonneti.
S. gracilis.
Aiolopus longicornis.
Aulocaroides leroii.
Acrotylus insubricus.
Tenuitarsus sp.
Spathosternum nigrotaeniatum.
Tropidopola sp. n.
Sudanacris pallida.
Cataloipus fuscocoerulipes.
Cataloipus sp. n.
Euprepocnemis plorans.
Amphiprosopia gwynni.

(ii) Chad and Maiduguri.

Pnorisa carinata.
Catantops axillaris.
Caloptenopsis i. clarus.
Mesopsis laticornis.

(iii) North of—

Thisoicetrus harterti (12° 30′).
Trilophidia repleta (12°).
Poekilocerus hieroglyphicus (12°).
Oedaleus senegalensis (11° 50′).
Acorypha picta (11° 45′).
Caloptenopsis onerosa (11°).
Kraussella amabile (11°).
Tristria pallida (10° 20′).
Catantops haemorrhoidalis (10°).
Pnorisa squalus (9° 30′).

(ii) North of (*cont.*)—

Hieroglyphus daganensis (9° 30′).
Phyxacra strenua (9° 30′).
Kraussaria angulifera (9° 30′).
Tylotropidius gaugeri (9° 30′).
Platypternodes savannae (9°).
Ornithacris c. cavroisi (9°).*
Thisoicetrus leani (9°).
Duronia tricolor (8° 30′).
Catantops stylifer (8° 30′).

(iv) South Of :—

Heteropternis thoracica (12° 10′).
Humbe tenuicornis (12°).
Catantops spissus (12°).
Catantopsilus taeniolatus (12°).
Euprepocnemis ibandana (11°).
Chirista compta (10°).
Ornithacris c. turbida (9° 50′).
Catantops simplex (9° 15′).
Atractomorpha gerstaeckeri (8° 30′).
Holopercna gerstaeckeri (8° 15′).
Paracinema luculenta (8° 15′).
Heteropternis couloniana (8° 15′).
Acanthacris r. ruficornis (8° 15′).
Cyrtacanthacris a. unicolor (8°).

(v) Climatic Forest Zone Only.

Epistaurus succineus.
Catantops modicus.
Stenocrobylus festivus.

(vi) Forest Zone Only.

Taphronota spp.
Abisares viridipennis.
Eupropacris coerulea.
Thisoicetrus pulchripes.

* One specimen taken at Yandev (7° 30′ N.).

(vii) Throughout Nigeria.

Paracomacris producta.
Morphacris fasciata, ab. *sulcata.*
Zonocerus variegatus.
Atractomorpha aurivillii.
Tylotropidius speciosus.

(viii) W.D., but Rare in "T.F.Z."

Oedaleus nigeriensis.
Gastrimargus africanus.
Trilophidia conturbata.
Acrotylus blondeli.
A. patruelis.
Pyrgomorpha kraussi.

(ix) W.D., but Not in Chad.

Spathosternum pygmaeum.
Catantops melanostictus.
Tylotropidius laxus.

(x) W.D. Outside C.F.Z.

Acanthacris r. citrina.

(xi) W.D. Outside F.Z.

Brachycrotaphus steindachneri.
Mesopsis gracilicornis.
Pyrgomorpha cognata.
Stenohippus xanthus (but not present in Chad).

A study of the available data for the range outside Nigeria shows that the majority of the most northerly species also occur in Fr. Sud. and A. E. Sud., and that the most southerly species occur in S.L., G.C. and B.C. (in some instances also in E. Afr., S. Rhod., etc.). Generally speaking, it can be said that the present survey was sufficiently extensive to give a true picture of the distribution of the majority of the commoner species in Nigeria.

Perhaps the two most interesting features are, firstly, the presence of *Mesopsis gracilicornis*, *Stenohippus xanthus* and *Pyrgomorpha cognata* in both the strip of Guinea Savannah to the west of Abeokuta and the Coastal Belt (although absent from the Forest Zone to the east), and secondly, the distribution of the subspecies of the large Catantopinae belonging to the genera *Anacridium*, *Ornithacris*, *Cyrtacanthacris* and *Acanthacris*.

(b) *Life-histories.*

The bionomical data collected by Gwynn and the writer at Kalkala and by the latter at Ibadan provide a clue to the life-histories of many of the Nigerian Acrididae. At Kalkala the most usual methods of passing the dry season are either an embryonic or imaginal diapause; one species (*Poekilocerus hieroglyphicus*) has a nymphal diapause, and others, mainly in the wetter habitats, continue to breed during this period.

At Ibadan most of the local grasshoppers appear to have two generations during the rains (March to November); it is probable that certain species have a short embryonic diapause during the dry season, but definite evidence is lacking. It seems certain that some of the univoltine species, such as *Taphronota amaranthina*, *T. ferruginea* and *Rutidoderes squarrosus* have a prolonged embryonic diapause during the dry season.

It has been shown (6) that *Zonocerus variegatus* has a prolonged embryonic diapause during the dry season in the north; while at Ibadan the vast majority of the eggs remain dormant from about April to mid-September or October, a few (usually near the river Awna) hatch in the spring. Adults of *Gastrimargus africanus* begin to appear at Ibadan in late September (or more usually October), while at Kalkala they appear in late June.

The life histories of some of the commoner Chad species are summarized in Table VII. The available evidence suggests that nearly all of the species

which have either an embryonic or imaginal diapause during the dry season are univoltine; the remainder probably have two or more generations a year.

TABLE VII.

Chad species with:

An embryonic diapause.	An imaginal diapause.	Two generations.
Acridella spp.	*Pnorisa squalus.*	*Amphicremna scalata.*
Duronia tricolor.	*Tristria pallida.*	*Acrida* sp. 1.
Orthochtha sp. n.	*Sudanacris pallida.*	*Calephorus* sp.
Macrocymochtha speciosa.	*Anacridium moestum.*	*Ochrilidia* sp. n., nr. *acuta.*
Kraussella amabile.	*Nomadacris septemfasciata.*	
Platypternodes savannae.	*Ornithacris c. cavroisi.*	*Paracinema tricolor.*
Oedaleus senegalensis.	*Acanthacris r. citrina.*	*Pyrgomorpha cognata.*
Zonocerus variegatus.	*Catantops axillaris.*	*P. kraussi.*
Hieroglyphus daganensis.	*C. haemorrhoidalis.*	*Oxya hyla.*
Spathosternum nigrotaeniatum.	*Acorypha picta.*	*Euprepocnemis plorans.*
Homoxyrrhepes punctícollis.	*Caloptenopsis i. clarus.*	
Kraussaria angulifera.		
Cataloipus spp.		
Thisoicetrus leani.		
Phyllocercus bicoloripes.		
Amphiprosopia gwynni.		
Bibulus coerulescens.		

With one exception all the species with an imaginal diapause belong to the CATANTOPINAE.

(c) *Phototaxis and Migration.*

The writer (5) has shown that the nights on which grasshoppers were abundant at light at Kalkala were characterized by high temperatures. The two main periods during which ACRIDIDAE are numerous at light in the Chad area are mid-May to mid-June and mid-Sept. to early October, i.e. at the beginning and end of the rains: during these periods the relative humidity at 15.00 hours is about 45 per cent. (7). It is evident that the hygrophilous species *Aiolopus* sp., *Duronia tricolor*, *Oxya hyla* and *Euprepocnemis plorans* were migrating in late May and June, 1933. *Oedaleus senegalensis*, *Acrotylus blondeli* and *Catantops haemorrhoidalis* were very abundant at light during that period, and the following species were not uncommon: *Pyrgomorpha cognata*, *Morphacris fasciata*, *Acrotylus patruelis*, *Catantops axillaris*, *C. stylifer*, *Caloptenopsis i. clarus* and *Tylotropidius* sp. During his visit to Mongonuin Sept., 1931, the writer took many species at light, including *Acridella* sp., *Hieroglyphus daganensis*, *Phyllocercus bicoloripes*, *Amphiprosopia gwynni* and *Orthochtha* sp. n. It is curious that many of the individuals of some of the very rare Chad species were collected at light, e.g. *Tropidopola* sp., *Aulocaroides leroii*, *Paracomacris pharaonis* and *Ochrilidia* sp. 5.

At Maiduguri, on the night of 21 May, 1933, grasshoppers of many species were very numerous at light at a rest house in the European Reservation: the nearest grassland was some considerable distance away, and it seems probable that a mass migration was taking place.

At Ibadan only 24 ACRIDIDAE have been taken at light; of these 9 were *Gastrimargus africanus* and 5 *Humbe tenuicornis*. It seems probable that these two Oedipodine species migrate (possibly only for short distances) during the night. Of the remaining 10 grasshoppers, belonging to 8 species, there is reason to suppose that three, viz. *Anacridium m. moestum*, *Ornithacris c. turbida* and *Acrotylus patruelis*, may have been on migration. It has already been stated that the only two specimens of *A. m. moestum* seen to the south of 9° N. were both taken at light.

(d) *Gregarious Tendencies.*

Apart from the locusts (*Locusta*, *Schistocerca*, *Nomadacris* and *Anacridium m. melanorhodon*) the only records of gregarious tendencies amongst the ACRIDIDAE in Nigeria are as follows: two small swarms of *A. m. moestum* were seen in the Adamawa Province in Feb. and Mar., 1947; bands of hoppers of *Zonocerus variegatus*, *Phymateus karschi* and *Oedaleus nigeriensis* have been found on several occasions.

Brédo (1) mentions that, in the Belgian Congo, a small swarm of *Phymateus viridipes* was seen in Ituri, and another of *Tylotropidius* sp. (accompanied by other species of grasshoppers) was observed in the Kabinda region. Another observation, by Ghesquière in the Belgian Congo, has been recorded elsewhere (22), viz., "*Au Lomami* (*Nord du Katanga*) *sur un front de* 5 *km. environ, un vol local très dense d'acridiens migrateurs secondaires composé principalement de Tylotropidius sp., accompagnés d'Acrotylus* (*patruelis, Sturm.?*), *Berengueria* (*obliquifrons Bol.?*) *et Heteropternis sp., a été observé dans les savanes situées entre Kabinda et Pania-Matumbo, direction Est-Ouest* 10 *heures a.m.* 1° *elévée, vent faible Est-Ouest*—20 *août* 1924—." This is presumably the second swarm mentioned by Brédo.

(e) *Relative Sizes of the Sexes.*

In every species the body length of the female exceeds that of the male. A study of the measurements of 48 common species showed that the mean male/female ratios were as follows: body length 1 : 1·35, hind femur 1 : 1·275. In many species it was noticed that the females were less active than the males; this is possibly the explanation of the relatively short hind femur in the female sex. Separate data for the four subfamilies are given in Table VIII below:

TABLE VIII.

Subfamily.	No. of spp.	Body.		Hind femur.	
		Ratio.	Range.	Ratio.	Range.
ACRIDINAE . .	10	1 : 1·35	1 : 1·18–1·62	1 : 1·24	1 : 1·17–1·39
OEDIPODINAE .	10	1 : 1·36	1 : 1·17–1·51	1 : 1·25	1 : 1·09–1·36
PYRGOMORPHINAE	8	1 : 1·39	1 : 1·23–1·62	1 : 1·31	1 : 1·18–1·47
CATANTOPINAE .	20	1 : 1·33	1 : 1·18–1·62	1 : 1·30	1 : 1·14–1·47
All ACRIDIDAE.	48	1 : 1·35	1 : 1·17–1·62	1 : 1·275	1 : 1·09–1·47

(f) *Colour Forms.*

Little mention has been made of the different colour forms which characterize a number of species. The most frequent are brown and green (or partly green); these occur in *Acrida* spp., *Aiolopus* sp., *Calephorus* sp., *Duronia tricolor*, *Gastrimargus* spp., *Heteropternis* spp., *Humbe tenuicornis*, *Mesopsis gracilicornis*, *Ochrilidia* sp. n., nr. *acuta*, *Oedaleus nigeriensis*, *Paracinema tricolor*, *Pyrgomorpha* spp., *Spathosternum nigrotaeniatum* and *Tristria pallida*. Evidence has been obtained (5) that, in some species, green coloration is characteristic of adults which have developed in humid conditions. Pink or reddish coloration along the inner margins of the elytra is found in some adults of *Acrotylus blondeli*, *Acorypha picta* and *Tylotropidius* sp., and there are striped forms of *Pnorisa carinata*, *P. squalus* and *Stenohippus bonneti*, it seems probable that these are inherited. There are a number of forms in *Acrida* spp., *Duronia tricolor* and *Tristria pallida* which may also be of genetical origin; in addition to brown and green individuals there are others with stripes.

(g) *Notes on the* Acrididae *of Ibadan.*

Of the 63 species recorded from Ibadan, 25 are extremely rare, i.e. less than 10 individuals have been taken. Some of these rare species are fairly common in the "true forest zone."

The vegetation of the Ibadan station has been briefly described in Section VI. The habitats of thirty-three species are shown in Table IX below:

Table IX.

(i) Short grass.	(iv) Tall grass.	(v) Secondary bush.
**Acrida* sp.	**Orthochtha brachycnemis*	*Zacompsa festa.*
**Chirista compta.*	**Amphicremna scalaris.*	*Holopercna gerstaeckeri.*
**Paracomacris producta.*	*Cannula linearis.*	*Taphronota* spp.
**Spathosternum pygmaeum.*	*Machaeridia bilineata.*	*Rutidoderes squarrosus.*
(ii) Short grass, paths, farmland.	**Oxya hyla minor.*	*Stenocrobylus festivus.*
**Humbe tenuicornis.*	*Chondracris baumanni.*	*Abisares viridipennis.*
**Morphacris f. sulcata.*	**Ornithacris c. turbida.*	*Thisoicetrus pulchripes.*
Aiolopus sp.	*Tylotropidius laxus.*	*Acanthacris r. ruficornis.*
**Oedaleus nigeriensis.*	*Euprepocnemis ibandana.*	*Eupropacris coerulea.*
**Gastrimargus africanus.*	*Carydana agomena.*	
Chrotogonus sp.		
(iii) Paths, farmland.		
Heteropternis spp.		
Trilophidia contubata.		

* All these 12 species are abundant at Ibadan; the other common grasshoppers are: *Zonocerus variegatus*, *Atractomorpha aurivillii*, *Catantops spissus* and *C. melanostictus.*

Most of the species found in secondary bush feed on dicotyledonous plants, as do *Eucoptacra anguliflava*, *Epistaurus succineus*, *Catantops simplex*, *Rhytidacris tectifera*, *Cyrtacanthacris aer. unicolor*, *Atractomorpha* spp., and, to a large extent, *Zonocerus variegatus*, *Catantops spissus*, and *C. melanostictus.*

If one excepts the few species which are common in the dry season, such as *Zonocerus*, *Gastrimargus africanus* and *Ornithacris*, it can be said that ACRIDIDAE are most numerous from about late March to mid-June and again from mid-Sept. to November. The mean maximum shade temperatures and relative humidities at 14.00 hours for these two periods were (in 1946) 89° F. and 57 per cent. and 87° F. and 62 per cent. respectively; the corresponding figures for the intervening period, when grasshoppers were scarce, were 82° F. and 70 per cent.

As stated above, only 15 species are common to both Kalkala and Ibadan (excluding 4 species represented by different subspecies in the two localities); of these 7 belong to the OEDIPODINAE. *Gastrimargus africanus* is the only Acridid which is abundant in both localities. Many of the OEDIPODINAE are widely distributed outside the "true forest zone," although some of the common Ibadan species do not occur in Chad.

The following species are more abundant in the "true forest zone" than at Ibadan: *Chirista compta*, *Holopercna gerstaeckeri*, *Paracinema luculenta*, *Heteropternis couloniana*, *Taphronota ferruginea*, *Atractomorpha gerstaeckeri*, *Acanthacris r. ruficornis*, *Catantops melanostictus*, *C. simplex*, *Stenocrobylus festivus*, *Thisoicetrus pulchripes* and *Euprepocnemis ibandana*.

(h) *Notes on the* ACRIDIDAE *of Kalkala.*

Of the 94 species recorded from Kalkala, 26 are extremely rare. The writer (5) has recorded the frequency of the commoner species (present in the first six months of 1933) in the main habitats; Gwynn's observations during the second half of the year (made in 1933 and 1934) gave very similar results. Gwynn encountered a number of species (mainly those with an embryonic diapause in the dry season) which were rare or absent in Jan.-June, 1933. The distribution of forty-four species in the main habitats is shown in Table X below; those species which occur mainly in one habitat are indicated by an x; those which are found commonly in two or more habitats are marked (1), (2), etc.; (1) denotes the most favoured. *Echinochloa* is the wettest habitat, followed by *Brachiaria*, *Cynodon*, *Chloris*, *Cymbopogon*, *Peristrophe* and old farmland (called *Pulicaria* in the paper quoted above) in order of wetness.

TABLE X.

Species.	*Echinochloa*.	*Brachiaria*.	*Cynodon*.	*Chloris*.	*Cymbopogon*.	*Perisstrophe*.	Old farmland.
1. ACRIDINAE.							
**Amphicremna scalata*	.	x	.	.	.	.	.
**Acrida* sp. 1	.	1	2	.	.	.	.
**Duronia tricolor*	.	1	.	2	.	.	.
**Orthochtha* sp. n.	.	1	.	2	.	.	.
**Macrocymochtha speciosa*	3	2	.	1	.	.	.
Kraussella amabile	.	1	.	2	.	.	.
**Paracinema tricolor*	2	1	.	.	.	.	.

TABLE X—*continued*.

Species.	*Echinochlor.*	*Brachiaria.*	*Cynodon.*	*Chloris.*	*Cymbopogon.*	*Perisstrophe.*	Old farmland.
**Ochrilidia*, nr. *acuta*	.	.	1	2	.	.	.
**Calephorus* sp.	.	.	x	.	.	.	.
**Mesopsis laticornis*	.	.	.	x	.	.	.
M. gracilicornis	.	.	1	2	.	.	.
Platypternodes savannae	.	.	.	1	2	.	.
**Pnorisa squalus*	.	.	1	2	.	.	3
P. carinata	.	.	.	2	1	.	.
2. OEDIPODINAE.							
**Aiolopus* sp. 1	2	1	.	.	.	.	.
**Acrotylus blondeli*	.	.	.	.	.	2	1
3. PYRGOMORPHINAE.							
**Chrotogonus* spp.	.	.	.	.	.	1	2
**Pyrgomorpha cognata*	.	.	3	1	2	.	
**P. kraussi*	.	.	.	.	.	1	2
Atractomorpha aurivillii	.	x	.	.	.	.	.
4. CATANTOPINAE.							
**Oxya hyla*	2	1	.	.	.	.	.
Spathosternum nigrotaeniatum	.	1	2	3	.	.	.
Hieroglyphus daganensis	2	1	.	.	.	.	.
**Tristria pallida*	.	3	2	1	.	.	.
**Sudanacris pallida*	.	2	.	1	.	.	.
Acanthoxia gladiator	.	x	.	.	.	.	.
**Ornithacris c. cavroisi*	.	.	.	.	x	.	.
Cyrtacanthacris a. goldingi	2	1	.	.	.	.	.
**Kraussaria angulifera*	.	.	.	.	1	2	3
**Catantops axillaris*	.	.	.	.	1	.	2
**C. haemorrhoidalis*	.	.	.	.	1	3	2
C. stylifer	.	.	.	2	1	3	.
**Acorypha picta*	.	.	.	.	3	1	2
Caloptenopsis sp. n.	.	1	.	2	.	.	.
**C. insignis clarus*	.	.	.	.	2	1	3
**Tylotropidius* sp.	.	.	.	2	1	3	4
T. speciosus	.	.	.	1	2	.	.
**Cataloipus fuscocoerulipes*	2	1	.	.	.	.	.
Thisoicetrus leani	.	.	.	.	.	1	2
**Euprepocnemis plorans*	2	1	.	.	.	.	.
Phyllocercus bicoloripes	.	x	.	.	.	.	.
**Amphiprosopia gwynni*	2	1	.	.	.	.	.
Bibulus coerulescens	.	.	.	.	x	.	.

* The above 28 species are abundant at Kalkala; the other common grasshoppers are: *Oedaleus senegalensis, Gastrimargus africanus* (in 1934), *Trilophidia conturbata, Anacridium moestum, Cataloipus* sp. n. and *Thisoicetrus harterti*.

It will be seen that the ACRIDINAE are very rare in the three driest habitats. Comparison with Table VII shows that most of the species thought to have either an embryonic diapause in the dry season or two generations in the year occur in the wetter habitats, whilst the bulk of those with an imaginal diapause are found in the three driest habitats.

X. SUMMARY.

(*a*) Data are given concerning the local distribution and bionomics of about 200 species of ACRIDIDAE. The bionomical information was obtained by Dr. A. M. Gwynn and the writer at Kalkala, near Lake Chad, and by the writer at Ibadan. Ninety-four species were found at Kalkala and 63 at Ibadan, of which 15 were common to both localities.

(*b*) The most interesting feature of the study of the local distribution was the fact that *Mesopsis gracilicornis*, *Stenohippus xanthus* and *Pyrgomorpha cognata*, which are species characteristic of the savannah zones, occur in the strip of Guinea Savannah to the west of Abeokuta and in the Coastal Belt near Lagos, although they are absent from the Forest Zone to the east (including Ibadan).

(*c*) The majority of the Chad ACRIDIDAE have either an embryonic or imaginal diapause during the dry season and appear to be univoltine. At Ibadan the majority of species appear to have two generations a year.

(*d*) In the Chad area grasshoppers are common at light at the beginning and end of the rains. At Ibadan only 24 ACRIDIDAE were taken at light; of these 14 belonged to the two Oedipodine species, *Gastrimargus africanus* and *Humbe tenuicornis*. It is thought that many Chad species and the two Ibadan Acridids mentioned above migrate during the night.

(*e*) Two swarms of *Anacridium moestum moestum* and hopper bands of *Zonocerus variegatus*, *Phymateus karschi* and *Oedaleus nigeriensis* were recorded.

(*f*) An account is given of the Acridid fauna of Kalkala and Ibadan, with special reference to the distribution of the commoner species in the main habitats in each locality.

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